Enthusiast'99

OFFICIAL PUBLICATION OF THE INTERNATIONAL 99/4 USERS GROUP

JULY 1983

Vol.1, Number 2

International 99/4 Users-Group

EDUCATION • ENTERTAINMENT • PERSONAL ENRICHMENT

PIECING TOGETHER THE SOFTWARE PUZZLE

CC-40 ADDRESS FILE

TAX ESTIMATOR — SIMPLIFIES RECORD KEEPING

PrintMate™ 99

THE MOST ADVANCED PRINTER IN ITS CLASS

Today's microcomputer and small business applications are more demanding and complex than ever before, requiring a new breed of printer that can call on capabilities designed to enhance your expression on paper. The PrintMate™ 99 is designed with the features to solve your print needs while increasing your computer's thruput. In fact, this printer mates so well with your applications that you'll agree that it should be called a "PrintMate™."

HIGH SYSTEM THRUPUT — PrintMate™ 99 speeds through each task at 100 characters per second. All printing, interface and paper handling functions are under direct control of PrintMate™ 99's microprocessor array. A quick cancel feature provides thruput of up to 150 lines per minute on short lines and the unprinted line slew rate is 600 lines per minute.

EXPANDABLE PRINT BUFFER — PrintMate™ 99 has a standard 1K buffer memory and is optionally expandable to 2K. In either configuration, PrintMate™ 99 will print while simultaneously accepting data from your computer, minimizing your micro's waiting time.

STANDARD POPULAR INTERFACES — PrintMate™ 99 is plug compatible with most popular microcomputers. Each PrintMate™ 99 is equipped for both parallel (Centronics) and serial (RS232C) interface. Other special interfaces are optionally available.

CORRESPONDENCE QUALITY —PrintMate™ 99 offers near letter quality printing with its 11x9 "serif-style" dot matrix correspondence font. The 7x9 dot matrix allows high speed printing at either 10, 12 or 17 characters per inch enabling up to 136 columns to be printed on standard letter width paper. Double wide characters are software selectable and can be intermixed on a line for message highlighting. Crisp printing is assured with a long life cartridge ribbon which can be changed in seconds.

PAPER AND FORMS VERSATILITY — Printmate™ 99 offers exceptional versatility in handling the paper, forms or special media that best suit your applications. Both friction and tractor feed are yours at the flick of a lever. Paper may be from 1 to 9.5 inches in width and multiple copy forms may be as thick as .012 inch without printhead adjustment. Paper and forms can be fed from the front, bottom or rear of PrintMate™ 99 to suit the convenience of your workstation.

SINGLE SHEET INSERTION — PrintMate™ 99's single sheet feeder option lets you insert single sheets of paper from the front of PrintMate™ 99 more easily than you load a typewriter. With the single sheet feeder and correspondence font, PrintMate™ 99 makes letter writing and printing on cut forms such as invoices simpler than ever.

TRACTOR FEED — The adjustable tractors give precise control when using fan-fold paper, preprinted forms and continuous labels. PrintMate™ 99's straight paper path performs trouble free printing on self-adhesive labels.

FRICTION FEED — PrintMate™ 99's friction feed allows the use of paper and other media that is not punched for tractor feeding. Roll paper may be easily used with the PrintMate™ 99.

GRAPHICS — High resolution, dot addressable graphics capability is included as a standard feature for applications using plotting, printing of screen graphics, special fonts and characters such as logos. The standard graphics capabilities of the PrintMate™ 99 allow the printing of 6120 individually addressable dots per square inch offering excellent resolution of graphics and special characters. Horizontal dot spacing is easily set to one of four dot densities.

SPECIALIZED GRAPHICS PACKAGES — PrintMate™ AP-PAK™ applications packages are designed to enable most popular microcomputers to excel in using PrintMate™ 99's special graphics and character capabilities. With PrintMate™ 99 and an AP-PAK™ you can create and edit your own special characters or utilize any one of several fonts. Graphs and bar charts are easily defined and printed using friendly AP-PAK™ software.

SOFTWARE AND HARDWARE CONTROL — Most PrintMate™ 99 functions may be controlled either by printer switch settings or by simple commands direct from your microcomputer. This enables you to print a variety of typestyles and sizes, graphs and special characters continuously under full program control. The PrintMate™ 99 is the responsive performer that perfectly mates with your microsystem or personal computer.

The Printer People
mpi™

Micro Peripherals, Inc.
4426 South Century Drive
Salt Lake City, UT 84107
Phone 1-800-821-8848

Texas Instruments Home Computer

SUMMER'S SUPER

CHECK OUR SUPER-SELLER LIST

PHM 3064	**TYPING TUTOR**
PHM 3111	**TI WRITER**
PHM 3113	**MULTIPLAN**
PHM 3112	**PARSEC**
PHM 3053	**TI INVADERS**
PHM 3004	**NUMBER MAGIC**
PHM 3056	**EXTENDED BASIC**

We carry everything TI makes for the 99/4A Home Computer as well as the best of the third-party software

ALL AT EVERY-DAY LOW PRICES

COUPON - MAIL TODAY
or send us a postcard.

FREE Subscription to the COMPUTER BULLETIN for the rest of 1983.

Name ______________________________
Street ____________________ State __________
City ______________________ Zip __________

ONLY $2.98 shipping and handling any size order any place in the continental U.S.A.

No extra charge for Visa or Master Card. Iowa residents add 4% sales tax.

The best combination of Price, Service and Quality is TRUE VALUE. More than just a name, it is our way of doing business.

DHEIN'S

True Value
HARDWARE STORE

(319) 236-3861

7 W. Airline Hwy.
Waterloo, IA 50703

Enthusiast'99™

Enthusiast'99
OFFICIAL PUBLICATION OF THE INTERNATIONAL 99/4 USERS GROUP
JULY 1983
Vol. I, Number 2
PIECING TOGETHER THE SOFTWARE PUZZLE
WAR GAMES
CC-40 ADDRESS FILE
TAX ESTIMATOR — SIMPLIFIES RECORD KEEPING

The Joseph Mills photograph on the cover of this issue illustrates the increasing complexity of putting together the software puzzle for your 99/4(A). In the INTERVIEW on page 4, Paul Zuzelo, President of Creative Software, gives you some insights to help you piece together your software puzzle.

LOOK FOR THESE SYMBOLS

They will "clue you in" on articles and stories of particular interest to readers in the areas of Home Computing, Professional Computing and Portable Computing.

- Home Computing 🏠
- Professional Computing ✒
- Portable Computing 💼

INTERVIEW

A Talk with Paul Zuzelo
President of Creative Software, Zuzelo talks with IUG President Charles La Fara about TI and third-party software for the 99/4A. 4

VIEWS By Dana Nichols 5

QUESTIONS & ANSWERS 6

MEMBER SPOTLIGHT 8

Features Edie Brown, a Californian who loves a challenge. Edie's next challenge is her most formidable one: designing an on-line information system for her employer, Terminal Data Corporation.

NEWS BYTES 10

BEST SELLERS 12

WOMAN'S VIEW By Regena

This issue, Regena has some helpful suggestions for women who wish to become more productive using their home computer. 🏠 13

HARDWARE

A True Professional Shows Its Colors By Charles La Fara
Texas Instrument's professional computer challenges the IBM PC and comes out ahead! IUG President Charles La Fara explains the TI professional computer, also known as Pegasus, and points out its superior capabilities. ✒ 15

Peeking and Poking — TI's New Portable — The CC-40 By Bill Gronos
Gronos gives a thorough explanation of the Compact Computer 40 and points out its advantages and capabilities. 💼 19

PERIPHERALS

Modems By Dana Nichols 💼 🏠 ✒ 25

SOFTWARE

Cubit By Charles La Fara 27

Publisher/President Charles La Fara ☐ **Managing Editor** Dana Nichols ☐ **Assistant Managing Editor** Gil Tinker ☐ **Copy Editor** Laurie Alsup ☐ **Senior Staff Editor** Guy S. Romano ☐ **Senior Technical Editor** Bill Gronos ☐ **Staff Technical Editors** Jack Carrel, Terry Heim ☐ **Contributing Editors** Regena, Jane McAshan, Jim Pick, Edie Brown ☐ **Advertising** Dana Nichols ☐ **Design and Production** Brian Tinker ☐ **Typography** 959th Tactical Graphic Production Squadron ☐ **Accounting** Virginia La Fara ☐ **Office Manager** Dorothy Armstead ☐ **Clerical** Linda Cooley ☐ **Program Operations** Mary Tilley ☐ **Fulfillment** Shelly Mulloy, Chad La Fara, Laurie Matlock, Christine Gibbs, Susie Eakins ☐ **Photography** Joseph Mills ☐ **Printing** Mercury Press, Oklahoma City, OK ☐ **Legal Counsel** Steve Mains/Roper, Lief and Mains/Attys. at Law/1507 Pine St./Boulder, CO 80302

International
99/4
Users-Group

EDUCATION • ENTERTAINMENT • PERSONAL ENRICHMENT

JULY 1983
Vol. I Number 2

PLATO By Dana Nichols
An in-depth look at Computer Assisted Instruction and how TI and Control Data Corporation have made Computer Based Learning available with the TI 99/4A. 29

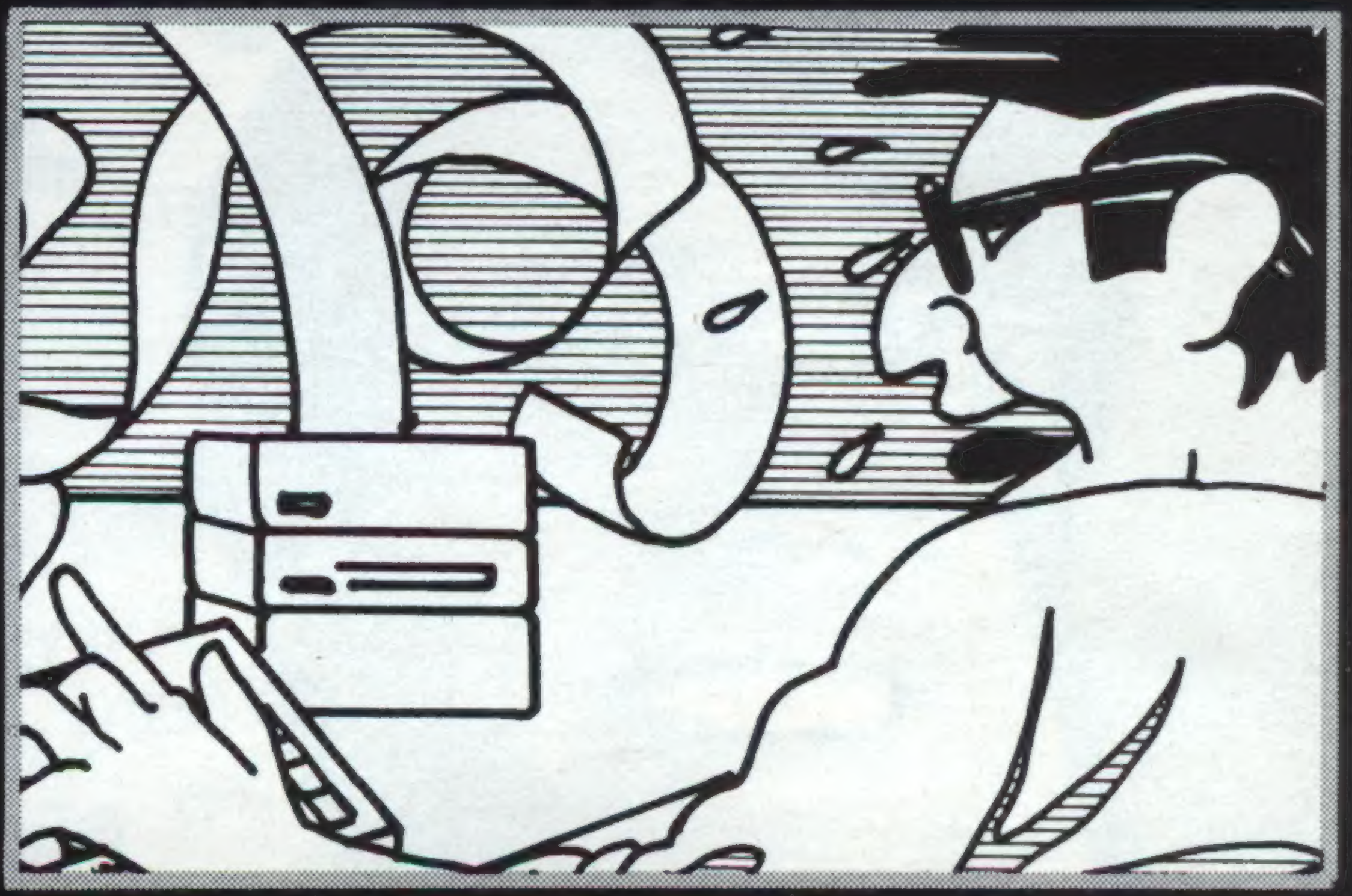
Extending BASIC **Cacti Kill** By Jim Pick 33

Companion By Terry Heim 35

Space Journey By Dana Nichols 35

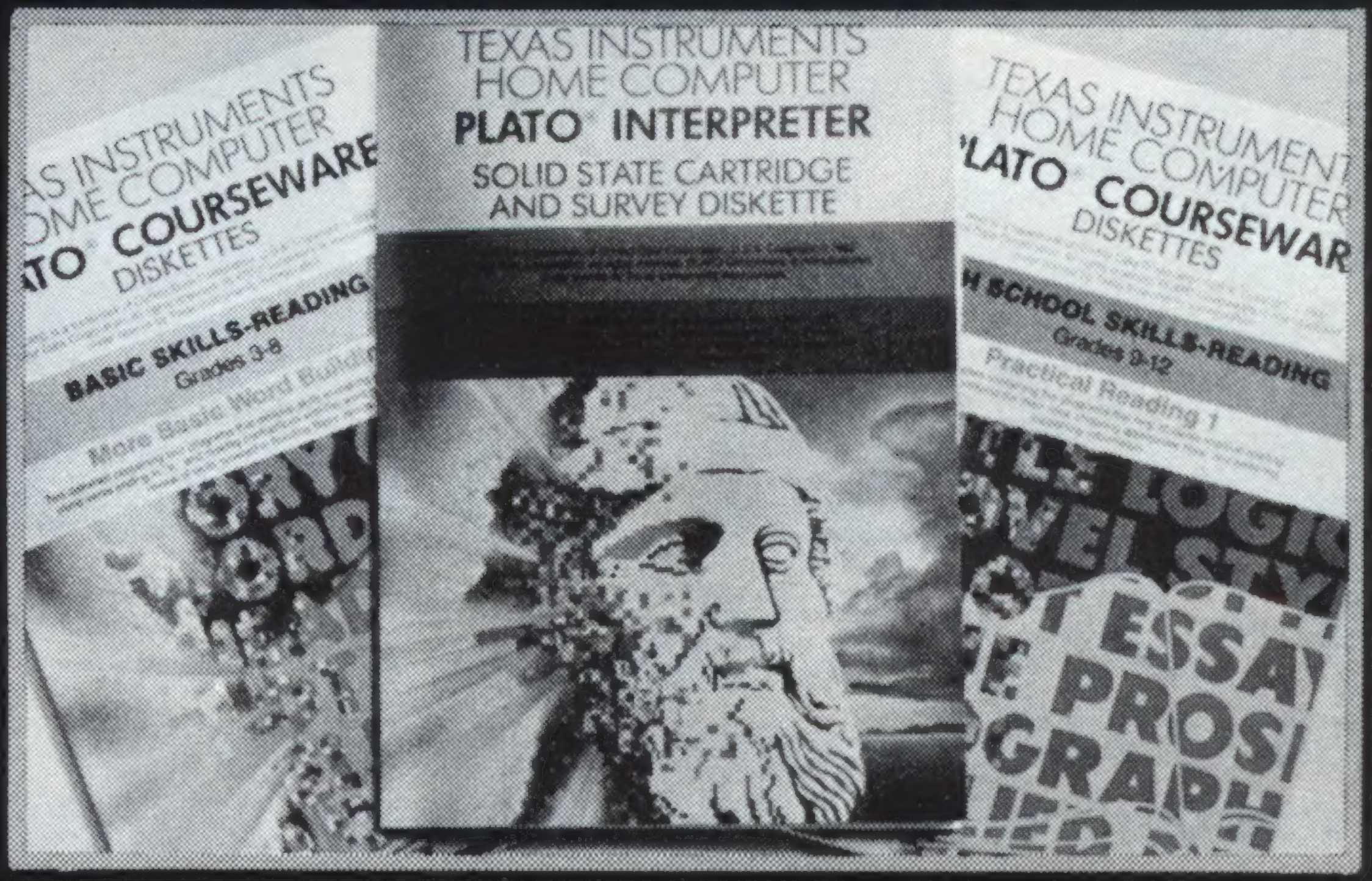
BOOK REVIEW — Smart Programming Guide for Sprites 36

CC-40 Address Book 37



Basic BASIC **Tax Estimator**
A useful, year-round program, you can use Tax Estimator to keep track of your tax situation. A versatile program, it can also be used to project predicted financial changes and their effects on yearly income. 38

Library Corner By Guy S. Romano 46


TEXAS INSTRUMENTS HOME COMPUTER
PLATO COURSEWARE DISKETTES
BASIC SKILLS-READING Grades 3-8
TEXAS INSTRUMENTS HOME COMPUTER
PLATO INTERPRETER
SOLID STATE CARTRIDGE AND SURVEY DISKETTE
TEXAS INSTRUMENTS HOME COMPUTER
PLATO COURSEWARE DISKETTES
HIGH SCHOOL SKILLS-READING Grades 9-12
Practical Reading 1

ETCETERA

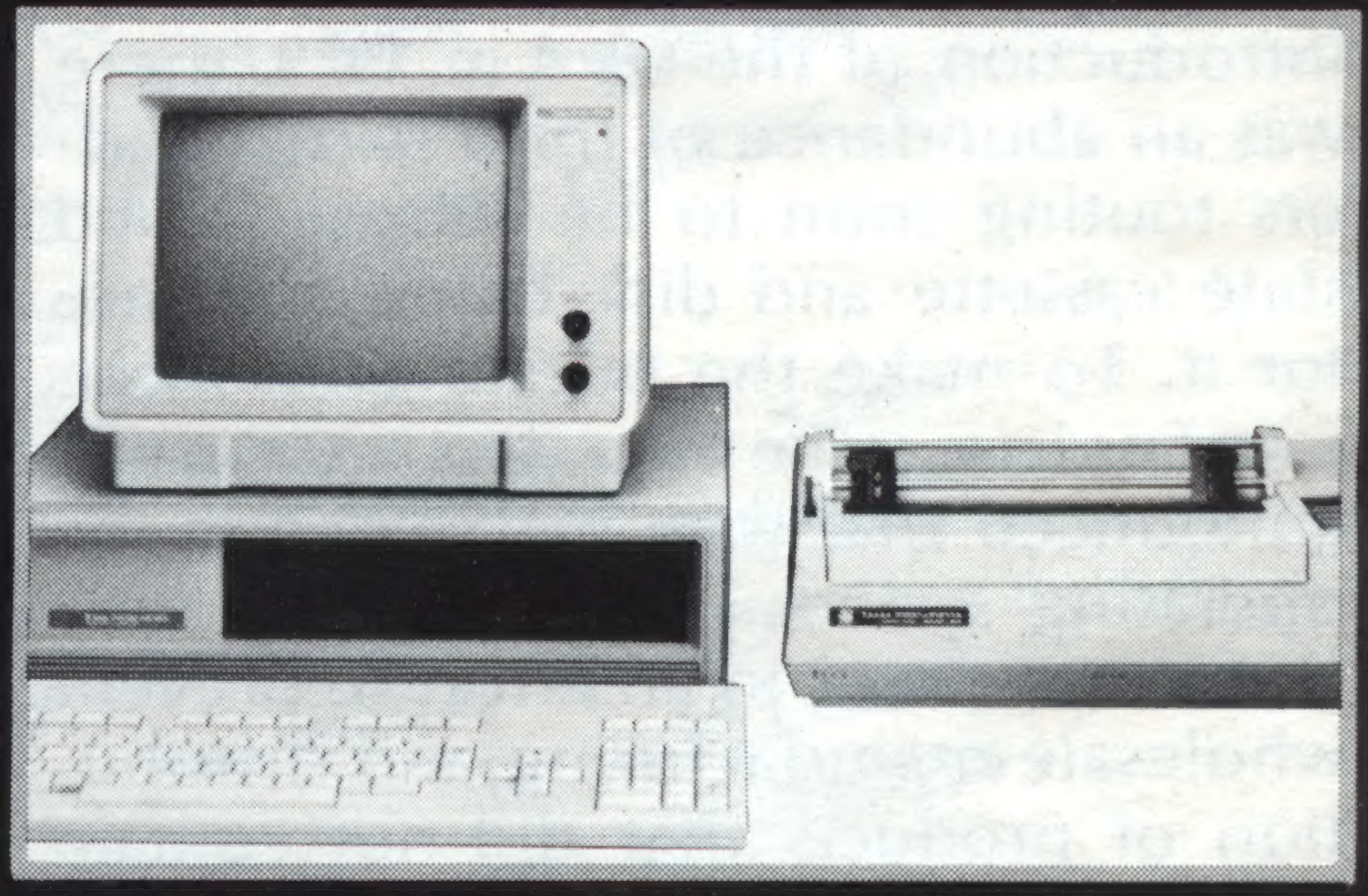
By Jack Carrel

Takes us into the TI 99/4A and explains the computer's inner working in addition to explaining how computers differ from one another. 48

ASSEMBLY LINE

By Bill Gronos

Simplify Your Assembly Programming With Coding Written Like BASIC
With the introduction of GATB™, Gronos provides a new method of learning Assembly language and includes a sample program. 50

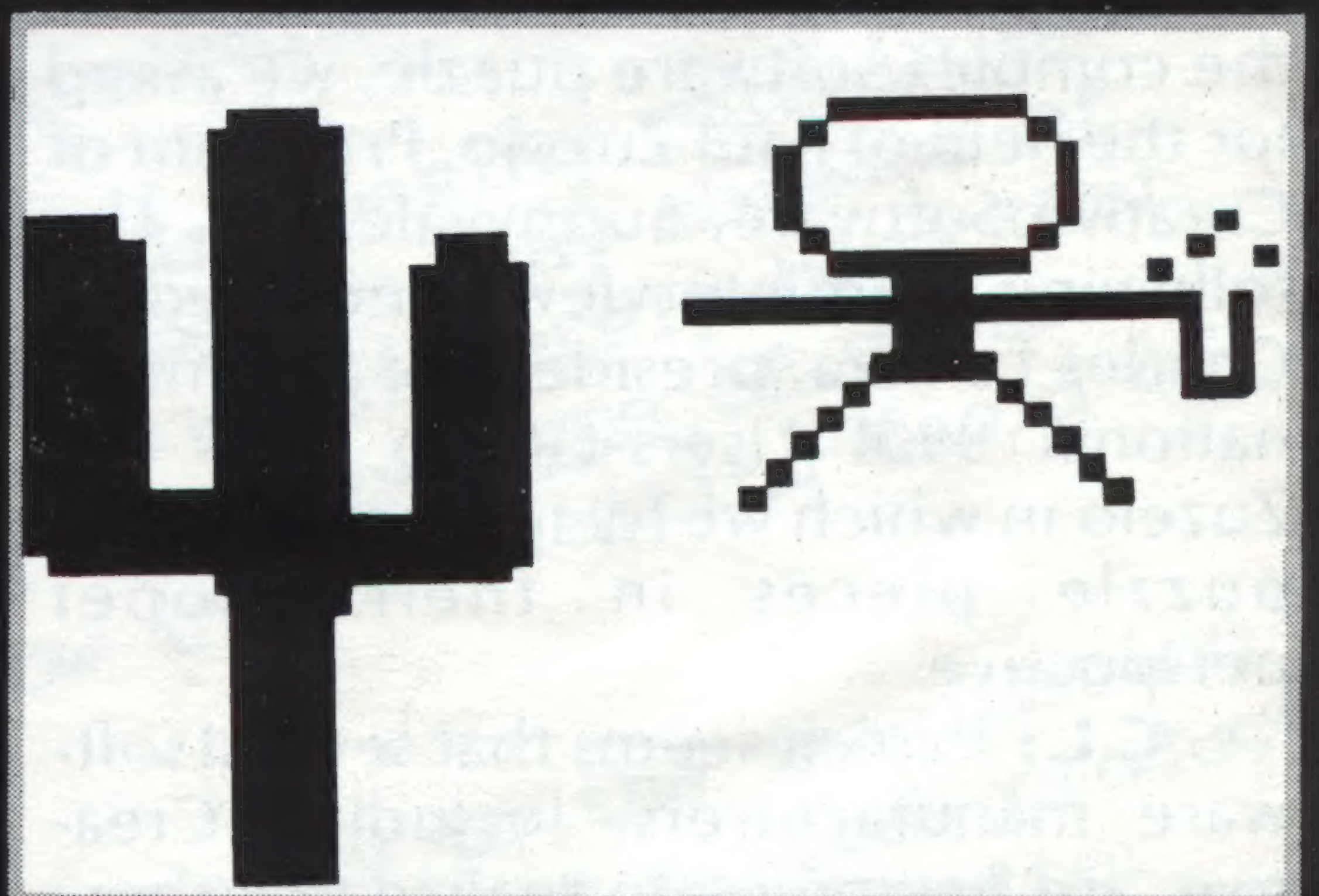


RETAILERS SHOWCASE

COMPUTERAGE
This Houston, Texas store is more than just a TI retail facility. In addition to an extensive software department, ComputerAge also offers other computer lines and accessories, and evening classes in computer programming. 57

USERS-GROUP SPOTLIGHT

Houston, Texas
Like all users-groups, the HUG suffered through "growing pains" and unanswered questions and problems concerning the 99/4(A). The HUG now boasts a large membership and a satellite group in the Johnson Space Center area. 59



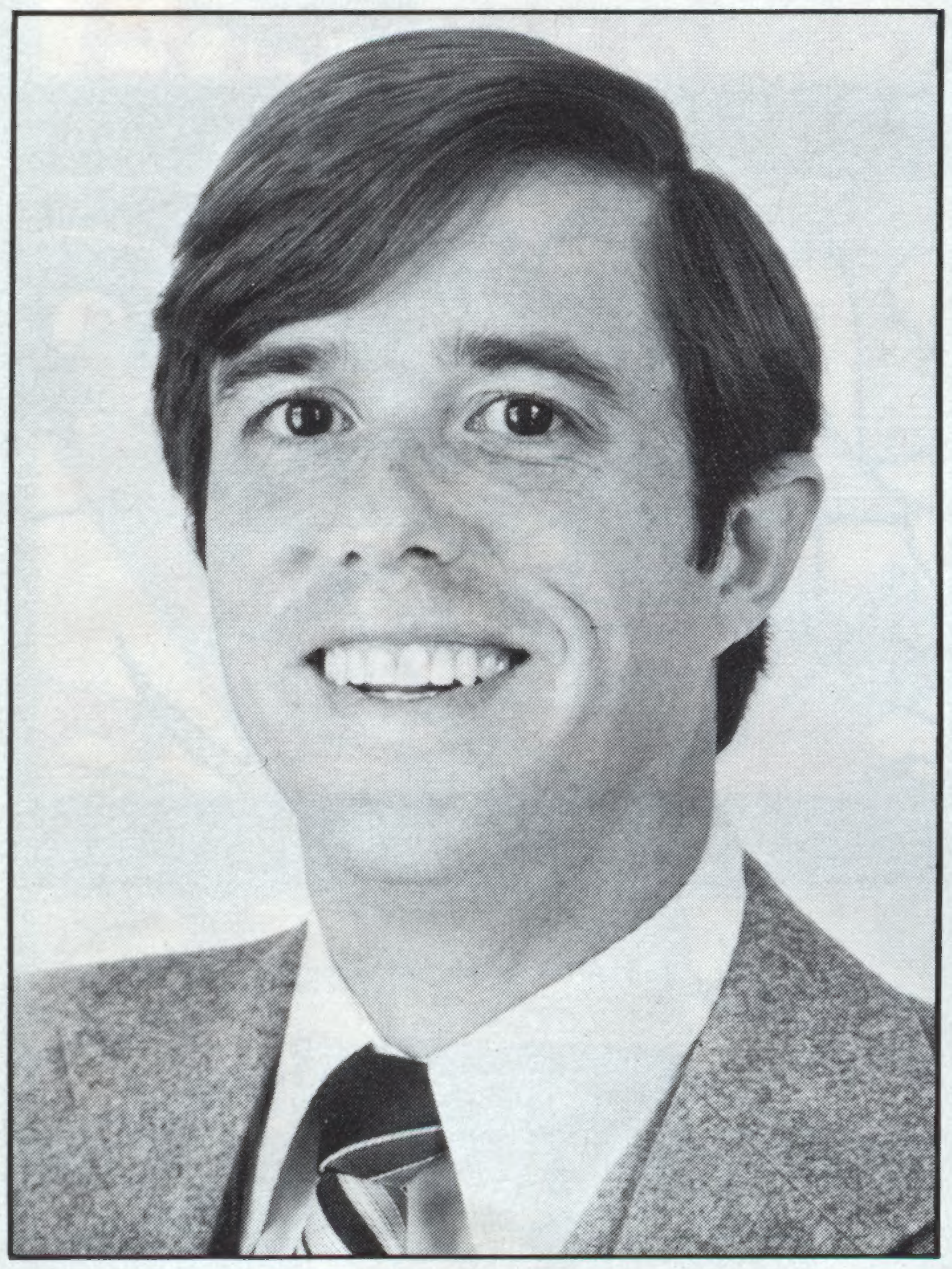
CHARLIE'S PAGE

By Charles La Fara 60

Enthusiast '99 Magazine (ISSN0737-9013), is published bi-monthly by the International 99/4 Users-Group, Inc., P.O. Box 67, Bethany, OK 73008 □ The Editorial office is located at 5400 N.W. 23rd St., Oklahoma City, OK 73127 (Tel.(405)948-1023). Office hours are Monday-Friday, 8:30 a.m. to 5:00 p.m., Central time. **Enthusiast '99** is published for members of the International 99/4 Users-Group as part of their membership dues and additional copies may be acquired for $2.50 each U.S. funds. Send address changes to P.O. Box 67, Bethany, OK 73008. □ Members wishing to send editorial correspondence to **Enthusiast '99** should address their correspondence to **Enthusiast '99**, P.O. Box 67 Bethany, OK 73008. Unaccepted manuscripts will not be returned unless accompanied by sufficient first class postage and a self-addressed envelope. **Enthusiast '99** cannot be responsible for lost manuscripts, photographs, or program media. □ Opinions expressed by the authors are not necessarily those of **Enthusiast '99**. □ Each separate contribution to this issue and the issue as a collective work copyright© 1983 by International 99/4 Users-Group all rights are reserved. □ Where necessary, permission is granted by the copyright owner for libraries and others registered with the Copyright Clearing Center (CCC) to photocopy any article herein with the base fee of $1.00 per copy of the article or item plus 25 cents per page. Payments should be sent directly to CCC, 21 Congress Street, Salem, MA 01970. Copy done for other than personal or internal reference use without the permission of International 99/4 Users-Group is prohibited. Requests for special permission or bulk orders should be addressed to the publisher. 99/4 Home Computer Users-Group, International 99/4 Computer Users-Group, and **Enthusiast '99** are registered trademarks of the International 99/4 Users-Group.

INTERVIEW

WITH PAUL ZUZELO, PRESIDENT, CREATIVE SOFTWARE



At a recent Consumer Electronics Show it became quite evident that new software offerings for the Texas Instruments 99/4A home computer are quite puzzling. For the first time since the introduction of the 99/4 in 1979, there was an abundance of third party vendors touting soon to be released solid state cassette and disk based software for it. To make the puzzle even more confusing, Texas Instruments announced that they had changed the operating system of the their popular home computer in an effort to prevent wholesale manufacturing and distribution of products that did not contain their stamp of approval (see insert).

In an effort to try to piece together the complex software puzzle, we asked for the help of Paul Zuzelo, President of Creative Software, Sunnyvale, CA. The following is an interview conducted by Charles La Fara, president of the International 99/4 Users-Group with Mr. Zuzelo in which we try to place all of the puzzle pieces in their proper perspective.

C.L.: Paul, it seems that several software manufacturers, including Creative, are beginning to realize that there is a vast market in software products for the 99/4A. However, it seems with so many players and Texas Instruments' attitude toward intervention into their overall plan it has created a massive jigsaw puzzle for the consumer. Would you mind helping us put the pieces together?

P.Z.: Not at all, Charlie. Where do we start?

C.L.: It's our understanding that Creative has just purchased Funware, a Richardson, TX cartridge manufacturer, who produces solid state modules for the 99/4A home computer. Could you please tell us about the terms of this agreement?

P.Z.: Yes, Creative has purchase Funware. The terms of the agreement call for Funware to remain in Texas as a subsidiary of Creative and they will continue to produce high-quality game programs for the Texas Instruments 99/4A home computer. Also in the future, Funware will be working on several home educational products.

C.L.: With so many people making educational products for the 99/4A such as Scott, Foresman and Company, Developmental Learning, Control Data Corporation with PLATO, and others, why would Creative want to enter the educational marketplace for this particular machine?

P.Z.: Unlike other manufacturers, Creative is not planning on using drill and practice type educational software. Rather, we prefer to produce what we call concept home educational products, which means that rather than a specific subject, we try to teach a concept which a student may not even be taught in school, such as shapes and volumes. We currently have two of these type products in distribution for the Commodore Vic-20. In fact, one of our concept educational products, Pipes, recently won an award for use with the Vic-20.

C.L.: What age group does this appeal to?

P.Z.: What we're trying to do is to see if we can go as low as seven or eight years old, but build enough escalating challenge in it so that it will be attractive to the high school student as well as older people. As a matter of fact, Pipes does that.

C.L.: Is Pipes a viable product for the 99/4A sometime in the future?

P.Z.: Yes, it will be. The Funware subsidiary will also be gearing up to do additional home educational conceptual software.

C.L.: Funware was previously licensed by Texas Instruments to allow their products to be manufactured in solid state modules. To the best of our knowledge, none of the other software manufacturers here at the show who are announcing cartridge software for the 99/4A have such an agreement. It seems to us that these manufacturers are showing little fear of reprisal from TI and plan to produce their products in spite of TI's stern warnings. How is Creative prepared to deal with this issue?

P.Z.: Possibly this question could be answered best by Michael Brouthers, President of Funware. However, we are prepared to state on each of our packages that contain solid state modules a guarantee that our cartridges will work on all current and future versions of the TI 99/4A. THAT WILL BE ON THE PACKAGES! It's not there currently because as far as we know, all of the Funware cartridges will work on the current installed base of machines.

C.L.: William J. Turner, President of the Consumer Group at Texas Instruments, was quoted on March 4 in the Wall Street Journal, "I'm offering the best deal in town," relating to TI's attempt to control distribution of cartridge based software for their machine. Do you agree with this statement?

P.Z.: Not necessarily. TI is trying to corner the software market for their computer. Sure, they have lots of distribution, especially among the mass merchandisers. However, we have been able to establish that we can put together a strong distribution program also. Let's go back for a moment to the Commodore Vic-20 cartridge market. Over the past year, we've established a very strong production, distribution and

(continued on page 7)

NOTICE

If you manufacture or sell plug-in cartridges for home computers, the following may be important to you.

Texas Instruments (TI) from time to time makes modifications in the design of its home computer products in order to reduce cost, improve reliability and performance, and safeguard its image as a manufacturer of quality products. Plug-in semiconductor cartridges marketed by TI for its 99/4A Home Computer each contains a proprietary auto-incrementing memory. In view of planned new introductions to its product line, cartridges which do not include an auto-incrementing memory will, in TI's judgment, no longer be compatible with all TI Home Computers.

TI holds patents that cover a number of proprietary features in the cartridges for its Home Computer. These patents include 4,243,984; 4,286,320; 4,298,949; RE 30,671; 4,304,964 and DES. 260,515. In addition, the U.S. Patent and Trademark Office has indicated that it will issue a patent relating to Allophone Speech to TI. TI does not intend to license these patents to others for supplying cartridges for the TI Home Computer. TI intends to enforce these patents against others who use them.

TI will discuss with potential developers arrangements wherein TI would be a licensee and distributor of such cartridges with attractive compensation to its developer.

TEXAS INSTRUMENTS

Circle No. 88 on product card.

Copyright © 1983 Texas Instruments

VIEWS

Enthusiast '99™
OFFICIAL PUBLICATION OF THE INTERNATIONAL 99/4 USERS GROUP

We would like to thank the many members of the International 99/4 Users-Group who have shown great enthusiasm over our inaugural issue of Enthusiast '99 magazine. Although it is extremely difficult to prepare a publication that meets the needs of each individual in our organization, we have tried our best to address specific subjects which we feel will be of interest to all our readers. As Enthusiast '99 continues, we will be adding additional features to broaden our members' overall knowledge of computers instead of addressing ourselves solely to the 99/4. As long as Enthusiast '99 is published, you, the member will be considered as each word is written. Your opinion is very important to us; we encourage your response to every edition.

Many of you have seen first-hand the IUG's progress from a small users-group to a major consumer organization. Our publication has grown from our first four-page newsletter to a bi-monthly President's Letter and Enthusiast '99. As with all new ventures, we will experiment with Enthusiast '99 for the first few issues until we find a format that reaches out to the greatest number of members each time Enthusiast '99 is published.

In this issue, we have addressed three computer families: the home computer, portable computer, and the Professional computer. Designated by accompanying symbols, you will be able to go directly to articles of the most interest to you. In addition, these divisions will enable you to get a better grasp of Texas Instrument's dedication to these respective markets.

As the computer continues to play an ever-increasing role in each of our lives it is extremely important that we stay abreast of the changes in this fast-paced industry. We sincerely hope that Enthusiast '99 can provide IUG members with the type of up-to-date information they will need to grow in the exciting field of personal computing.

New adventures in computing are limited only to the imagination of the user, and through this imaginative use of hi-tech products you, the personal computer owner cannot only create a better environment for yourself and your family, but for all mankind.

Dana

QUESTIONS & ANSWERS

Q A friend of mine who owns an Apple computer says that about once a year he has to have his disk drive heads aligned so they will track properly. Will I have to do this with the drive I use on my 99/4A?

A One of the very first drives for the 99/4A was given to the Users-Group by Texas Instruments in April 1980. This drive has been in continuous use for over three years now, and has never failed to read a single track as far as we know. Of the 15 drives we use here at the Users-Group, we have had only one failure, and it was due to a power supply problem. With proper user maintenance (cleaning the heads once each month and vacuuming the chassis each six months) your disk drives should last you for many years under normal home use.

Q How safe it is to mail-order computer hardware and software products?

A There are specific federal laws concerning how mail-order companies conduct their business. These laws, however, are difficult to enforce and for many consumers, the time involved in recovering a small monetary loss is just not worth the hassles. Texas Instruments computer owners for the most part have been fortunate as there have been very few reports of unfavorable business practices being conducted through the mail for software and hardware products used with TI equipment.

Here are some helpful hints you should look for when purchasing products or services offered by mail-order companies:

1. Is a working telephone number listed for the company offering its products or services?

2. Have you seen the advertisement for this specific product or service listed more than once in a reputable publication?

3. Is the advertisement general in nature? Good products normally require more specific information in the advertisement itself.

4. Is there a trial period for use or a money-back refund offered?

If you're still in doubt, you may wish to consider any of the following.

a. Contact the publication where the advertisement was listed about the company's reputation.

b. Contact the Better Business Bureau in the city where the company is located.

c. Check with the postmaster in the city where the company is located to see how many, if any, formal complaints have been lodged against it.

Mail-order is a convenient and efficient way to buy computer hardware and software, but the consumer should exercise the same caution he uses when making any other purchases.

Q Why does Texas Instruments announce products as being available in a specific quarter and then do not deliver them to retailers for several months after that date?

A This pre-announcement policy seems to be an industry standard that is not unique to Texas Instruments. New technology in the computer field changes on a daily basis, and to stay ahead of competition, manufacturers will sing the glory of new products months ahead of actual production runs. What seems to happen most often to delay announced products, is that additional technological breakthroughs are made from the time of product announcement to the time actual production schedules are to be met. Manufacturers such as Texas Instruments wanting to give consumers the best possible product for their money may incorporate these new advances or implement cost efficient production procedures which may delay new products several months beyond its actual announced release date. Other delays may be caused by third parties who are unable to deliver critical parts for final assembly prior to production runs. Product demands can also cause delays. If a manufacturer forecasts that the initial rollout of a product should be ten thousand pieces, and retailers place orders for fifty thousand pieces, the manufacturer may withhold the product until such time that supplies can meet demands. This policy avoids giving retailers who ordered large quantities an unfair advantage. Texas Instruments has become increasingly aware of the frustration long-range announcements have on both retailers and consumers and have recently taken steps to narrow the gap between announcement and delivery on many of its product lines.

Q I want to learn more about LOGO before I purchase the new LOGO II module. Can you tell me where I might find some books on this subject?

A There are several good books detailing the uses and formats of LOGO and several more due to be published in the near future. Listed below are some you may wish to consider:

LOGO Reference Flip Chart. Scott, Foresman and Company, Glenview, IL. A structured, self-teaching curriculum designed for the first-time LOGO user. Excellent for both teaching and reference work.

Teach Yourself TI LOGO. Availability, fall 1983. Byte Books/McGraw-Hill. Offers an introduction to TI LOGO for children featuring Sprites and Turtle graphics.

1,2,3, My Computer and Me. Reston Publishing Company, Reston, VA. A LOGO storybook designed for children.

The Turtle's Sourcebook. Reston Publishing Company, Reston, VA. This book contains a collection of Turtle graphic activities in worksheet format.

Mindstorms. BASIC Books, New York, NY. Written by LOGO's principal developer, Seymour Papert, this is probably the most popular introduction to LOGO.

Learning With TI LOGO. Available late 1983. Byte Books/McGraw-Hill. A hands-on guide for children and adults, featuring projects such as interactive games, and programs listings.

Bibliography of LOGO Memos. MIT, Artificial Intelligence Laboratory, Cambridge, MA. Probably the most comprehensive book on the development of LOGO. Offers capsule descriptions of over 60 available publications describing more than a decade of LOGO research at MIT.

Q I have heard that by punching a hole in the reverse side of my single sided disk, that I can actually use both sides . Is this true?

A In many cases, this procedure is successful. However, there are some potential problems you should be aware of. Single sided disks are certified by their manufacturers for one side only. The reverse side has never been tested for defects. In a single sided disk drive, pressure pads rest against the unused side of the floppy disk. Many times, bits of debris may become caught between the pad and the disk surface, producing scratches. The scratches do not affect the use of the good side of the disk unless, of sourse, you turn it over and use the reverse side. Then, two things can happen: By using the reverse side, there is a distinct possibility that you may scratch the original, or good surface, of your disk. Additionally, there is potential danger in damaging the pressure pads.

Damage to disk envelope is another problem which should be considered. By punching a hole in the disk envelope, you may accidentally leave particles of envelope material that are unnoticeable to the naked eye. These particles can do serious damage to the disk surface itself as well as the disk drive.

Although we have heard of many users practicing the policy of using both sides of a single-sided disk, it is certainly not recommended.

Q I continue to have a problem loading programs into my computer from tape, even though I know I have a compatible recorder. Do you have any helpful suggestions?

A Here are some simple rules to follow when using cassette tape as a mass-storage system.

Use good quality tape. That does not mean you have to buy special, high-priced digital quality tape. Chrome, ferrichrome, or other specially formulated tape will probably not increase performance.

Mark your volume and tone settings. Once you have saved a program from your 99/4A to cassette and have reloaded it successfully back into memory, use some fingernail polish or model airplane paint to mark your tone and volume settings. Tapes purchased from third-parties may require different settings; however, once you make a back-up copy you should be able to reload them at your predetermined settings.

Watch out for leaders. Most cassettes have clear, plastic leaders at the beginning of each side that cannot be recorded on. Always be sure to fast forward your cassette a few inches beyond the leaders before loading a program. In most cases, any damage to a cassette will occur within the first few inches of tape.

Be sure your tape is rewound. Loose tape in a cassette shell is distributed to the capstan at a faster-than-normal rate. Many times, this leads to it becoming trapped between the capstan and the pinch roller, and you may destroy your tape in trying to free it.

Check your tape before recording on it. Rewind the cassette fully and zero your tape counter. Check your written log to make sure that you have advanced the tape to a blank area. This procedure assures that you do not over-record important data that may be on the tape.

Try removing the remote jack. According to Texas Instruments' Technical Data manuals, the remote jack is not switched. This results in a slight slowdown of the data transfer rate, because of a pull on the cassette recorder's motor. Although in most cases it is insignificant, it may be of some help in loading your data.

Q Recently my neighbor's house was destroyed by fire. His 99/4A computer and most of his peripheral equipment, as well as printer were destroyed along with many other personal items, including all of his software. To his surprise, none of it was covered by his homeowner's insurance policy. Is this just an isolated case?

A "Coverage on personal computers vary considerably from company to company," says Jim Hunt, J.V. Hunt & Associates, Nashville, TN. In most cases, if your computer is strictly for personal use, it is covered as part of your personal property. Most insurance companies, however, require that your computer is "usual and incidental to your property." This means that the item is commonly found in the home. Many companies will deny your claim if your computer is used even partially for business purposes. In these cases, the best you can expect to receive is partial compensation. Every computer owner should check his policy, then check with his insurance agent as to their coverage. Most companies require floaters or endorsements; that is, an amendment to your policy covering computer equipment. Another important thing to remember is that as new peripheral equipment and software is added to your system, you must inform your insurance company. A $100 reimbursement for a console is of little consolation if $3000 worth of additional add-on equipment and software is destroyed.

Q I hope that a member of your staff can give me some information about a phenomenon which may or may not indicate that there is a problem with my 99/4A console. The console gets very hot. I generally do not have it switched on for more than two hours at a time. Usually, after about half an hour, the underside of the console on the right side near the on-off switch, is hot to the touch. The console is on a flat tabletop and there is nothing obstructing the airflow around it. So far, fortunately, there have been no problems with the functioning of the unit. It just gets hot.

A It is not unusual to find this in all 99/4A consoles. Although the heat generated at that location on the console is more than one would normally expect, there is no danger to your computer. In fact, it has been suggested that along with other features supplied with the 99/4A console, TI has also supplied you with a good hot plate for your coffee during those long sessions at the computer!

Enthusiast'99
is published for you!

To make this magazine the most helpful to our members, your articles and suggestions are invaluable. If you wish to submit an article or program we would be happy to review them for possible use. See page 45 for more information.

(INTERVIEW: con't. from page 4.)

marketing capability and what that means is we can go to the same retailers and same distributors who carry the Vic-20 and the TI 99/4A. We instantly have nearly 5000 retail outlets, because of the marketing structure we have already set up for the Vic-20 and the number of retail outlets carrying our products is increasing on a daily basis. There's no doubt that at this point in time, TI has more retail outlets than anybody else does for that machine, but I don't believe that's necessarily going to be true by Christmas of this year.

C.L.: One of the things that we have seen with the Funware packages is a dedicated commitment to graphic quality as well as innovation in speed concept. Will this continue now that Creative has entered the picture?

P.Z.: We certainly believe so. The commitment is really through Funware. One of Michael Brouthers' strongest commitments is to graphics, animation, and sound. Funware has done as good a job as anyone can with the capabilities of the 99/4A, and is far superior to any other third party products that we have seen. The graphics you see now in the Funware products are going to be as good if not better in future products that we release in both the game and home education segments.

C.L.: Thanks, Paul, for helping us put together some of the pieces of the software puzzle. Is there any other comment that you would like to make to our readers?

P.Z.: Not really, other than the last half of 1983 should be an exceptional year for new software products for the 99/4A. We know how strong our commitment is to this machine and can see that other software manufacturers are now beginning to see the potential of putting their products in cartridge form for the 99/4/A. I think that the one who will benefit most once all the pieces of the puzzle are put together is the consumer.

C.L.: Thanks once again, Paul, for your time, and we wish you continued success with both Creative and Funware.

P.Z.: Thank you, Charlie.

MEMBER SPOTLIGHT

EDIE BROWN

Challenges, particularly technological ones, are what make Edie Brown tick! A woman of diverse talents, Edie has progressed from one adventure to another: flying, motorcycles, sky diving, and most recently, computer technology.

Edie's knowledge of home computers, particularly the TI-99/4, recently earned her an opportunity to tackle her biggest challenge yet: defining an on-line, fully integrated management information system for her employer, Terminal Data Corporation.

Although Edie began working for TDC in 1974, she's been tinkering with technology since she was a young girl.

Edie's interest in technology began when she was nine years old. Her family moved from Glasgow, Montana to Anchorage, Alaska, then a relatively small community (approximately 20,000 pop.) somewhat isolated except for the local radio station, which provided residents with news of both local and worldwide events. Edie amused herself during the long winter evenings by assembling radios from assorted materials she gathered from various sources in the community.

After the death of her father, Edie, her mother, and Edie's two sisters moved to Florida where she joined the Civil Air Patrol and learned to fly. Eventually the family migrated to California and settled in the San Fernando Valley on the outskirts of Los Angeles. While attending San Fernando high school, she continued flying for the Civil Air Patrol and won a number of honors. Among them, the opportunity to represent the State of California at the annual National Encampment in San Antonio, Texas.

Like many young college graduates, Edie wasn't sure what she wanted to do with her life so she drifted back and forth across the country (bumming, as she calls it). She spent six months in a tower high up in the Angeles National Forest watching for fires with only a German Shepherd puppy as company. Edie then spent six months tending bar in a 'classy' lounge in New Orleans. She has only one thing to say about this stage in her life..."it was an education!"

Flying proved too rich for Edie's paycheck, so she took up motorcycle riding at a time when it was popular to believe in the "Hell's Angels" image portrayed by Hollywood. However, to Edie it was just another exciting challenge. First, she bought a motorcycle and talked someone into teaching her to ride. Later, with the help of friendly mechanics and books, Edie taught herself to perform minor repairs and maintenance on all the motorcycles she has owned. She recently purchased a 1983 Honda SilverWing completely equipped for touring. Edie plans to spend at least a portion of her vacation this year touring the Southwestern states.

Although Edie began working for Terminal Data Corporation in 1974, she's been tinkering with technology since she was a young girl.

Several years ago, at an age when most people would know better, Edie accepted a challenge from a friend to take up sky diving. Having always had a secret desire to jump from an airplane, she couldn't resist. So, one bright, sunny morning, after an evening of practice jumps off kitchen chairs and a fifty-gallon drum, Edie boarded a small airplane, climbed 5000 feet into the smogless Southern California sky, and jumped into the desert below. Having successfully avoided several joshua trees, a barn, and numerous cacti, she landed in a plowed field. She was so thrilled by the experience she climbed back into the plane and made another jump. However, jumping out of airplanes gradually lost its thrill and she eventually stopped skydiving.

She is an avid follower of NASA's manned space program, JPL's various trips to the distant planets and a devoted "Star Trek" fan.

Edie's interests then turned to technology. She grew up in Southern California where the aerospace industry plays an important part in the local economy, and was drawn to technology of the future. She is an avid follower of NASA's manned space program, JPL's various trips to the distant planets and a devoted "Star Trek" fan. Her interest in computers heightened, and has grown continually since she began working for Terminal Data Corporation (TDC) in 1974.

TDC designs, develops, manufactures and markets high speed, computer controlled micrographics and video based information systems and components for managing large automated files. As Manager of Sales Administration for six years, Edie worked with customers from all over the world.

When the company purchased an IBM System 34 for its manufacturing operations she was appointed Management Information System Manager, and was faced with the challenge of bringing her department "on-line" to the new computer system. Although she had worked with computers for a number of years, this was her first opportunity for "hands-on" experience.

Fascinated by the computer's potential for the home user, Edie took the plunge and in January, 1980, bought her first TI-99/4 and a cassette recorder for storage. Edie said she chose the TI for several reasons: the color graphics, plug-in software, the company name, and relative ease of the operating equipment. A problem Edie encountered involved the type of programs she was interested in; business oriented software wasn't available for the 99/4. Edie saw a new challenge, and proceeded to learn to program her own applications. However, she knew no one else with a computer and TI-99/4 information was relatively nonexistent to computer magazines. There was no one to turn to for help if she got stuck with a bug in a program she couldn't locate, so Edie's efforts were strictly trial and error. It was at this time she received a letter from a user's group in Oklahoma City asking if she was interested in joining their organization. Edie quickly mailed the card back with a reply of "yes, have programs - will trade" and thus became one of the original IUG members. She was thankful to have at last found someone else with an interest in the 99/4

Edie said she chose the TI 99/4 for several reasons: the color graphics, plug-in software, the company name, and relative ease of the operating equipment.

Today Edie lives in Thousand Oaks, a community fifty miles north of downtown Los Angeles. Her home, which she shares with friend Beverly Taylor and two very personable but "pesty" Siamese cats, sits on a ridge overlooking the Conejo Valley. "Lucy" and "Schroeder", named after the Peanuts characters, seem to share her interest in the computer. When Edie's at the console you will usually find Lucy draped around her neck and Schroeder perched on the monitor, both seemingly spellbound by the data on the screen. One of the home's four bedrooms has been converted to serve as an office/computer room and it's here Edie spends most of her leisure time, working with her computer. She owns the additional 32K memory, two disk drives and an Epson MX100 printer enabling her to do just about anything that's required.

Edie is currently Treasurer of the Tri-Valley 99ers, a local user's group organized since the beginning of the year. She's also working on a new financial management program which she says "will do just about everything except pay my taxes."

What does the future hold for Edie Brown? If she were younger she no doubt would be training as an astronaut but since that isn't possible she is looking to the future for other things. She's looking forward to replacing her 99/4A with one of the new 99/8 models that TI will be distributing in the fall, and continues to learn as much as possible about the computer, both in the area of home applications and in her work. The day is coming, Edie says, when the computer will completely run our homes, protecting them and serving as an integral part of every home environment.

She owns the additional 32K memory, two disk drives and an Epson MX100 printer enabling her to do just about anything that's required.

By that time, however, Edie will have moved on to new challenges. Perhaps she will have assembled a "furry" C3PO or an R2D2 to keep Lucy and Schroeder company.

I want Enthusiast'99 also.

Please send me information on how I can plug into your network of computer owners as a member of the International 99/4 Users-Group.

Name ______________________
Address ____________________
City _______________________
State ______________________
Zip ________________________

Mail to:
International 99/4 Users-Group/P.O. Box 67/Bethany OK 73008

International 99/4 Users-Group

INDEX TO ADVERTISERS

ADVANCED SOFTWARE 23
AMERICAN SOFTWARE DESIGN & DIST. CO. 41
AMNION 34
AMLIST 16
ARTIOS 27
ALPHA 2 41
COMPRO SYSTEMS 44
DENALI DATA 57
DHEIN'S TRUE VALUE HARDWARE STORE 1
INSTRUMENTAL SOFTWARE SYSTEMS 32
INTELLITEC 17
INTELPRO 36
INTERNATIONAL 99/4 USERS-GROUP 61
J&KH SOFTWARE 37
LOLITA WALKER GILKES 42
MICRO-PERIPHERALS inside cover
MILLERS GRAPHICS 47
MIRAGE SOFTWARE 42
NAVARONE 40
NOT-POLYOPTICS 14
NOVELTY WORLD 45
PARRYSOFT 40
PER-COM DATA 21
SOFTWARE SUPPORT, INC. 26
TAB BOOKS 43
TENEX 58
TEXAS INSTRUMENTS 28,30-31, back cover
TRACKSMITH 41

NEWS BYTES

JACK KISHPAUGH

Jack Kishpaugh, an IUG member, was recently named Texas Handicapped Person of the Year by the Texas Rehabilitation Association.

A quadraplegic for over 10 years, Kishpaugh, Fort Worth, Texas, has been an active member of the IUG for over two years.

Working with the National Paraplegia Foundation, Kishpaugh designed a "Mobile Computer Skills Evaluation Unit," to demonstrate that handicapped persons can be trained in the use of computers and then be gainfully employed, working on computer terminals located within their own homes.

In addition to his research concerning computer applications, Kishpaugh is actively involved in the National Paraplegia Association, Veterans Administration, and serves on the Board of Directors of Texas Area 5 Health Systems Agency.

COMPUTER FUNDING UNDER DEBATE

The California State Assembly is debating on a bill in its legislature concerning the Computer Education Act of 1988. The proposed bill focuses on computer literacy issues for teachers, students and the general public, and would channel funding appropriated under the Local Technology Assistance Program strictly into computer-related activites.

Established in 1982 to provide funds for educational technology, the Technology Assistance Program announced around $850,000 available for funding.

IBM ANNOUNCES GIVEAWAY

Approximately 1500 IBM PCs will appear in 84 secondary schools and 12 teacher training institutes as a result of an $8 million giveaway by IBM.

Selected schools will receive assistance in the training and support of the staff at the teacher training sites. The sites will be in New York, California and Florida.

The systems, equipped with both IMB DOS and PASCAL, will consist of the following: 128K capacity PCs, color monitor, two disk drives and a graphics printer.

As no instructional courseware is included in the system, it appears students will use the system in a computer science program whereby they will write their own programs.

DIGITAL RESEARCH ANNOUNCES VISUAL CP/M FOR HOME COMPUTERS

Digital Research recently announced it will be marketing a home version of CP/M called Visual CP/M. Available from Mattel, Coleco, Atari, Epson and Sinclair, the CP/Ms will be sold through Toys 'R' Us, K-Mart, Sears, Penneys and Wards.

Digital Research COO John Rowley has projected that Digital will sell two to four million units of CP/M in the next 1-2 years. Digital also plans to introduce a version of LOGO and some home applications programs.

COMPUTER-RELATED DEATH REPORTED

A dispute between a customer and a computer store owner over the interfacing of a printer and computer ended in tragedy with the fatal shooting of the store owner.

Forty-two year old Floyd French, Gladstone, MO, was arrested at the scene and charged with murder. The shooting occurred at the Altair Computer Center in Prarie Village, KS.

The victim was owner Henry Phillips Bouldin, 42, Overland Park, KS. Bouldin was shot in the upper-left shoulder shortly before noon on May 14. He was pronounced dead one hour later.

According to police, French had a bought a computer from Altair and a printer purchased elsewhere and asked Bouldin to make the two compatible. According to an unidentified employee, the printer had worked for one year with another of French's computers.

When French was presented a bill for $180, covering the cost of factory modification and shipping, he became irate and fired two shots from a .38-caliber handgun at Bouldin.

After the shooting, police said, French moved toward the front of the store where three employees subdued him until police arrived. According to Prairie Village police chief Louis LeMaske, the suspect believed that Altair would modify the printer for free.

Bail for French was set at $100,000.

PREVIEW GAMES FROM CABLE TV

Mattel Electronics and several other computer manufacturers are currently researching the idea of allowing potential buyers to preview solid state game modules through the use of a cable television hook-up. Mattel's Play Cable is distributed via FM frequencies and received by a General Instruments manufacturer adapter to the Intellivision system. The first test was distributing Intellivision's games to a potential market of 750,000 cable suscribers. Mattel, however, was unable to achieve its 5 per cent market penetration goal. Mattel recently announced it will also be providing adapters to owners of Atari game machines so these owners will be able to receive Play Cable.

TWO—COMPUTER FAMILY MAY APPEAR

According to a recent TALMIS report, the two-computer family may already be here. A TALMIS home study recently conducted showed that of 10 thousand families surveyed, one of every seven is likely to purchase a second home computer.

Brand loyalty ranked highest among owners of the Texas Instruments 99/4A home computer as those surveyed said they would most likely purchase another Texas Instruments computer in the future. Owners of the Timex-Sinclair 1000 ranked highest among those who are expecting to purchase an additional computer in the next 12 months.

The TALMIS report also asked computer users if they were totally satisfied with their computers. Of those surveyed, ATARI 800 users were most satisfied, with IBM and Apple in second place. The least satisfied were Timex-Sinclair users, most of whom complained about the keyboard. TRS-80 owners were dissatisfied with the graphic limitations of the machine, and very few intended to purchase an additional Radio Shack computer.

$100 MILLION LOSS BLAMED PARTIALLY ON HOME COMPUTER

Texas Instruments, Inc. recently disclosed that it expected to lose up to $100 million during the second quarter of 1983. This news sent TI stock into a three-day tailspin in which it lost more than $40 per share.

A Texas Instruments spokesman said its problems began suddenly in the second half of May when retailers cancelled orders for many of its solid state software products, due to sharp buildup of inventories in home computer video games and related products. Many retailer complained of flat 99/4A sales, even after an announced $100 customer rebate in mid-May.

In addition to lower sales, the company said it expected second quarter losses to stem from price cutting throughout the industry and from increased reserves for rebates and price protection payments to retailers who were caught with heavy inventories.

Sources at Texas Instruments said they plan to reduce production in 1983 for both their 99/4A computer and appropriate software. Experts estimate the company had been selling approximately 150,000 units per month. The cutback "will require a significant change in the second quarter inventory and writeoffs," the company said.

Additionally, Jon Campbell, TI press relations, told the International 99/4 Users-Group that the company has abandoned its plans to introduce the 99/2 computer due to price reductions of the 99/4A.

"It is clear that with continued price reductions in the industry the 99/2 is no longer a viable product," he went on to say.

The International Users-Group has been advised that Texas Instruments plans to continue a strong development program in new hardware and will continue with a vigorous software expansion program, using capital expenditures estimated in the area of $450 million for the remainder of 1983. The announced $100 million loss made TI's net income $7.1 million, or 30 cents per share, compared with $27.7million, or $1.17 per share for the same period a year ago. TI's total sales rose approximately nine percent to $1.1 billion from $1.08 billion during the same period.

TEXAS INSTRUMENTS REALIGNS CONSUMER PRODUCTS DIVISION

Texas Instruments startled the consumer electronics world last month when it announced the reorganization of its Consumer Products Division in Lubbock, Texas. The reorganization included the replacement of Don Bynum, vice president of the Consumer Products division, by Herb Shanzer, who had previously headed TI's Calculator and Portable Computer program.

Observers attributed the reorganization of the Consumer Products division to a high level of unhappiness with the negative impact the 99/4A home computer had on the company's recently announced first-quarter earnings. Although gross profits were reported to be off by some $50 million over last year's figure, certainly not all of this could be attributed to the recent transformer problem that kept new shipments of computers from the marketplace for nearly two months.

This observer feels that TI's corporate management may be "sandbagging" shareholders somewhat in anticipation of good third- and fourth-quarter earnings.

The consumer products reorganization also included a new commitment to software. Jim Adams, a 20-year plus TI employee, has been appointed vice president of the Home Computer Software division. Adams' vast computer experience, coupled with a new corporate committment to software development leads us here at the Users-Group to believe that TI is on the right track for the first time in software procurement.

Software must become a key factor in our overall plan, stated a Dallas-based TI executive. Chairman of Texas Instruments' Board of Directors Mark Shepherd stated at their annual shareholder meeting in April,

"Profit erosion, due to the competitive nature of the home computer market, has cost us much more than we expected this year."

Although it may take some time for TI's reorganization to have any real effect in the marketplace, we here at the Users-Group certainly feel it is a step in the right direction.

OOPS!

For those of you who tried to call Guy Romano and got the COOKIE COMPANY instead, we apologize. For those of you who tried to program "Helicopter Attack" and got RETURN WITHOUT GOSUB IN 2410 instead, we also apologize. The following corrections should provide for smooth sailing. Guy Romano's phone number in San Francisco is (415) 753-1194. To enable you to attack, the following corrections should be made:

```
210 ON ERROR 2370
220 CALL CLEAR : : GOTO 2420
```

BESTSELLERS

Based on International Users-Group Purchases
for May and June 1983

TEXAS INSTRUMENT & THIRD PARTY SOFTWARE

RABBIT TRAIL (Funware)

A "climbing" game in the mold of Donkey Kong, the object of this solid-state cartridge game is to collect all of the carrots on each screen without being caught. Seven different screens increase competitive nature of the game.

EXTENDED BASIC

Programming language compatible with TI BASIC which includes enhancements such as: multi-statement lines, IF-THEN-ELSE- statements, direct screen accessing, output formatting with "using" clause, and easily programmed character sprites.

TERMINAL EMULATOR II

Links your 99/4A to the telecommunication world — accessing subscription data service and time shared computer systems. Also incorporates full text speech which can be used to enhance user-written programs or certain TI and third party software packages.

TOUCH TYPING TUTOR

Teaches the beginning typist to touch type using the TI 99/4A keyboard. Also helps the reviewer to improve speed and accuracy at touch typing. Includes lessons covering letters, numbers and symbols; a diagnostic section with word-per minute (WPM) timing; individual keystroke analysis and practice; and a practice game to improve typing speed. TI 99/4A only.

TI WRITER

TI's disk-based word processing program features many professional qualities for both home and business use. 32K RAM and disk system are required.

WIZARD'S DOMINION

Only the Wizard's Apprentice, the Evil Wizard, the Hero and the Evil Prince have enough courage to defeat them and rule Wavoria. Inside the caverns of the Wizard's Dominion lay gold, adventure and magical powers.

PERSONAL RECORD KEEPING

Create, maintain and utilize a computer-based filing system that's useful and convenient for a variety of applications — including home inventory for insurance purposes, car maintenance records, medical and dental records, and a complete reference for birthdays, anniversaries and other important occasions.

MINI-MEMORY

A solid-state command module that provides additional memory for your system as well as important tools for programming development. This module contains a total of 14K bytes of memory: 6K bytes of (GROM), 4K bytes of (ROM), and 4K bytes of (RAM).

MINUS MISSION

One of the new arcademic games in the Developmental Learning series of software. This solid-state module is designed for those needing drill and practice in basic subtraction skills.

HENHOUSE (Funware)

A solid-state software cartridge that offers many hours of arcade-type action. The object of this game includes the collection of eggs to take to market prior to the poacher or the wolf playing havoc in the henhouse.

USER-WRITTEN SOFTWARE

1132: MINER

Prospect for gold in an underground mine while eluding floods and cave-ins. Bank your money and achieve the glories of wealth.

1382: KRAZY KOALA

A very cute and cuddly game. Superb graphics and chart. You must help the koala to get his mate, picking fruit as you go along the way.

1224: SPACE COMMAND (Extended BASIC)

While destroying enemy spacecraft to defend our galaxy you must maneuver your ship with calculated caution. Hi-Res Graphics and total use of TI 99/4A capabilities add excitement to this program.

1242: ALIEN DESTROYER (Extended BASIC)

Exceptional speed and visual effects make Alien Destroyer a SUPER game.

2159: MOTHER GOOSE

One of the best children's programs in our entire library, listen as an animated Rocky Ro-Bot recites Mother Goose nursery rhymes. Speech Synthesizer and Terminal Emulator II are required.

3269: "MORNING HAS BROKEN"

Will play softly through your 99/4 console while sailboats float off into the sunset on your screen. One of the best Sam Moore programs in our library.

4396: PIGGY BANK

A highly graphical teaching tool which explains the value of saving money and how to count it.

5511: BAR-GRAPHER

Program creates bar graphs using your own data and several easy to view formats. A very useful program.

7022: BILL TRACKER

An excellent program for tracking monthly expenditures on credit cards as well as an excellent record-keeping program for fixed or variable household bills.

8005: GOLF HANDICAPPING

This program adheres to the USGA system as closely as possible. You must establish the course rating, then enter previous scores to find out your true handicap.

A WOMAN'S VIEW

By Regena
P.O. Box 1502 Cedar City, UT 84720

We didn't really intend this column to be a "sexist" type column. The simple fact is that a large majority of the International 99/4 Users-Group are male. One of the goals of this column is to show how women as well as men can enjoy computing. We welcome "feedback" — how are some of you women using home computers? I'll report in this column some applications that other women might be interested in.

Quite a few people have asked how I got started (and what I'm doing now,) so I thought I'd share with you how one woman entered the microcomputer world. In 1980 my husband and I decided to get a home computer for Christmas. We had wanted a computer for some time but felt we couldn't afford (justify) one. I spotted a TI-99/4 at a consumer show and picked up a pamphlet. The next day we bought one, then we could hardly wait the two weeks for Christmas. We soon discovered that this Christmas present changed our lives more than any other purchase.

We started staying up nights writing programs because the children played with the computer during the day. I found out about the IUG and soon met Charles La Fara by telephone. A few months later the 99'er Magazine started and accepted every program I submitted. I decided to use "REGENA" as my programming name and officially registered as a business (Regena happens to be my real middle name.) This new-found hobby became an actual business of my own.

Eventually I helped as the Program Editor for the 99'er — debugging programs to make sure they worked before publication. I also did some microcomputing consulting. I discovered Chromasette paid better for programs and figured a TRS 80 Color Computer would pay for itself — so I expanded. I later acquired a VIC-20 as partial payment for programs for another client. I've been able to get the TI-99/4A, a printer, and peripherals in exchange for programming and consulting, plus I sold my own software on cassette.

I spotted a TI-99/4 at a consumer show and picked up a pamphlet.

Last fall we made a major move (from North Salt Lake to Cedar City, Utah) and I re-evaluated my business. I visited COMPUTE! Magazine and now write monthly columns about BASIC programming for their magazines. I am also writing books which are being published by COMPUTE! Books.

The nicest thing about my work is that I can be at home with my five children — yes, I'm "just" a housewife in a small, southern Utah town. My toddler sits by me at his "puter" while I'm working at mine. My family acts as my in-house quality control test facility. My oldest daughter will work for me this summer typing listings from magazines to build up our library of programs. My oldest son helps by duplicating cassettes for sale. All the children give me ideas for new programs.

This little history should give you several ideas of what women can do with home computers. The computer world offers opportunities for home-based businesses, which are becoming very popular. If you like to sell, of course you can sell home computers. You may also demonstrate the computer, either for a particular store or as a Texas Instruments representative working for a specific region. I know two women who are regional marketing supervisors for the Scott, Foresman Company. They assist Scott, Foresman dealers in their marketing efforts plus provide service support.

Hundreds of thousands of computers were sold for Christmas last year alone. All of those consumers now need software. An ideal business for women is selling software. I know several women who have started their own software distributing companies. You can sell microcomputer software (as in a retail store), or you can specialize. You can work for a particular publishing company. Perhaps you can sell software written just for the TI-99/4 and TI-99/4A. Perhaps you want to sell games only, or just educational software, or you can even specialize in a particular subject area such as music education.

Another opportunity is publishing software — actually reproducing the cassette programs and packaging a product for the market. The software market is still so new that there are all kinds of marketing techniques yet to be tried. Many companies started with just one good program to sell then gradually expanded to become now-famous software publishers and distributors.

Programming — actually writing the software — is another job opportunity. My programming led to writing and other steps of the software world, but my first love is programming. Ideas for programs are all around — friends and neighbors often casually ask if you can do such-and-such on your computer. If you can't yet — there's an idea for a program. As I mentioned, most of my ideas for educational programs come from my children. for example, a Utah school requirement is that all seventh graders learn the counties of Utah. The computer is ideal for any drill work — and you use the randomization feature to change the drill each time. I use the high-resolution graphic capabilities of the TI to draw the counties — and there is another program. The computer can be used as a learning tool in just about any educational subject.

The computer world offers opportunities for home-based businesses, which are becoming very popular. Hundreds of thousands of computers were sold for Christmas last year alone. All of those consumers now need software.

You can either market your own programs or work with a publishing company. Since home computers are relatively new, publishing companies are also relatively new in the computer software industry, and your product could be in high demand. A word of warning here — since publishing companies may be inexperienced in producing software, you need to be careful about the company you are working with — make sure you know exactly what effort they will be putting in for your product, their target market and method of advertising and distribution, and your royalties and responsibilities.

If you enjoy writing, you can sell articles to magazines, or you can start your own publication. Many of the present computer magazines started out as small newsletters. I know of one magazine that started about two years ago as a four-page, typed newsletter. It is now a monthly magazine of over 150 pages and subscribers all over the world.

Teach! If you have a teaching certificate, high schools are screaming for good teachers. If you are already teaching in another field, let your

On Sale from NOT-POLYOPTICS
The 99/4(A) Program People

Five New Games for the 99/4(A)

In TI Console Basic -

Treasure Trap An exciting new concept in graphic adventure. Break into the Builders' Planetoid and explore myriad rooms on your quest for High Tech treasure. A different adventure each time you play!

99'uaders All the finger-slamming adrenalin of the arcade favorite at half the cost. Fight back wave after wave of galactic kamikaze aliens from the last outpost on Earth.

In TI Extended Basic -

Laser Tank On a battlefield of the future maneuver your Coherent Infra-red Equipped Vehicle (CIREV) into position for the lightning quick laser duels with similarly equipped enemy tanks. Chase and engage in the battle zone.

Waldoball Androids are pitted against Robots in this soccer game of tomorrow. Combines the action of team sport with the machine cool of pinball.

Arcade Monopoly Play this all time favorite with full graphic representation on your screen. Choose between regular and arcade versions. The arcade game adds quick movement, rolling obstacles, and the ability to blitz opponents' properties with super projectiles.

And don't forget the games that made NOT-POLYOPTICS: Great strategic games such as Khe Sanh, Sengoku Jidai, Ant Wars, Ships!, and Hordes. Great action games like Tickworld, Maze of Ariel, and Cars & Carcasses 2. Great board games like Addvance and Crosses. And of course the best selling Winging It flight simulator and Starship Pegasus game of CETI.

A New Peripheral that will change how you interact with your computer!

The Texas Light Shooter A photoreceptor gun that plugs into the joystick port of your 99/4(A) to allow you to shoot at targets on the screen. Included with the Light Shooter are complete instructions and a shooting spree game on cassette. Our supply will be limited initially so hurry ordering this item.

NOT-POLYOPTICS
13721 LYNN STREET, SUITE 15
WOODBRIDGE, VIRGINIA 22191
☎(703) 491-5543

NAME________________________________
ADDRESS______________________________

$18.00
☐ Starship Pegasus ☐ Khe Sanh ☐ Sengoku Jidai ☐ Hordes ☐ Ant Wars
$15.00
☐ Laser Tank ☐ 99'vaders ☐ Arcade Monopoly ☐ Ships! ☐ Winging It
$13.00
☐ Treasure Trap ☐ Waldoball ☐ Maze of Ariel ☐ Tickworld ☐ Addvance
$10.00
☐ Crosses ☐ Cars & Carcasses 2
☐ Texas Light Gun $30.00
10% discount on orders of $20 or more. Total of Order______
Virginia Residents add 4% sales tax.
$1.00 Shipping for Light Gun.
© 1983 by Not-Polyoptics.

supervisors know of your interest in computers. Many states are now requiring a semester of computer literacy or even computer programming — which means the schools will need teachers. Even if you aren't certified, you can teach private classes or teach in non-public schools. When I was living in the Salt Lake City area, I taught computer awareness seminars and BASIC programming classes and really enjoyed it. Last summer I held a couple of "mini" computer camps — children came two and a half hours a day for a week. The main idea was to show children what computers would do, but most of them were writing programs (such as games) by the end of the week.

Join or start your own local users group. It's fun to get together with someone else who shares your interests. the TI owners that I know are very friendly and very willing to share information and ideas on how to use home computers. You can also get informal reviews of software from each other before making a major purchase. If you are a programmer, you can learn many techniques from others.

My family acts as my in-house quality control test facility. My oldest daughter will work for me this summer typing listings from magazines to build up our library of programs.

Volunteer to help at the schools. School budgets in general are so tight there isn't extra money to pay resource people, so volunteers are welcome. Parents should not sit back and complain about a school's shortcomings but should help in any situation they can — after all, the school is "tending" our children many hours each day. Sometimes teachers are asked to be superhumans in order to accomplish the amount of work they do for a classroom full of students. You can help teachers or aides learn how to use the computer in their classrooms, or you can work directly with the children who are using the computers. Many of the computers in our elementary schools have actually been purchased by Parent-Teacher organizations. You can give on-going support to these purchases.

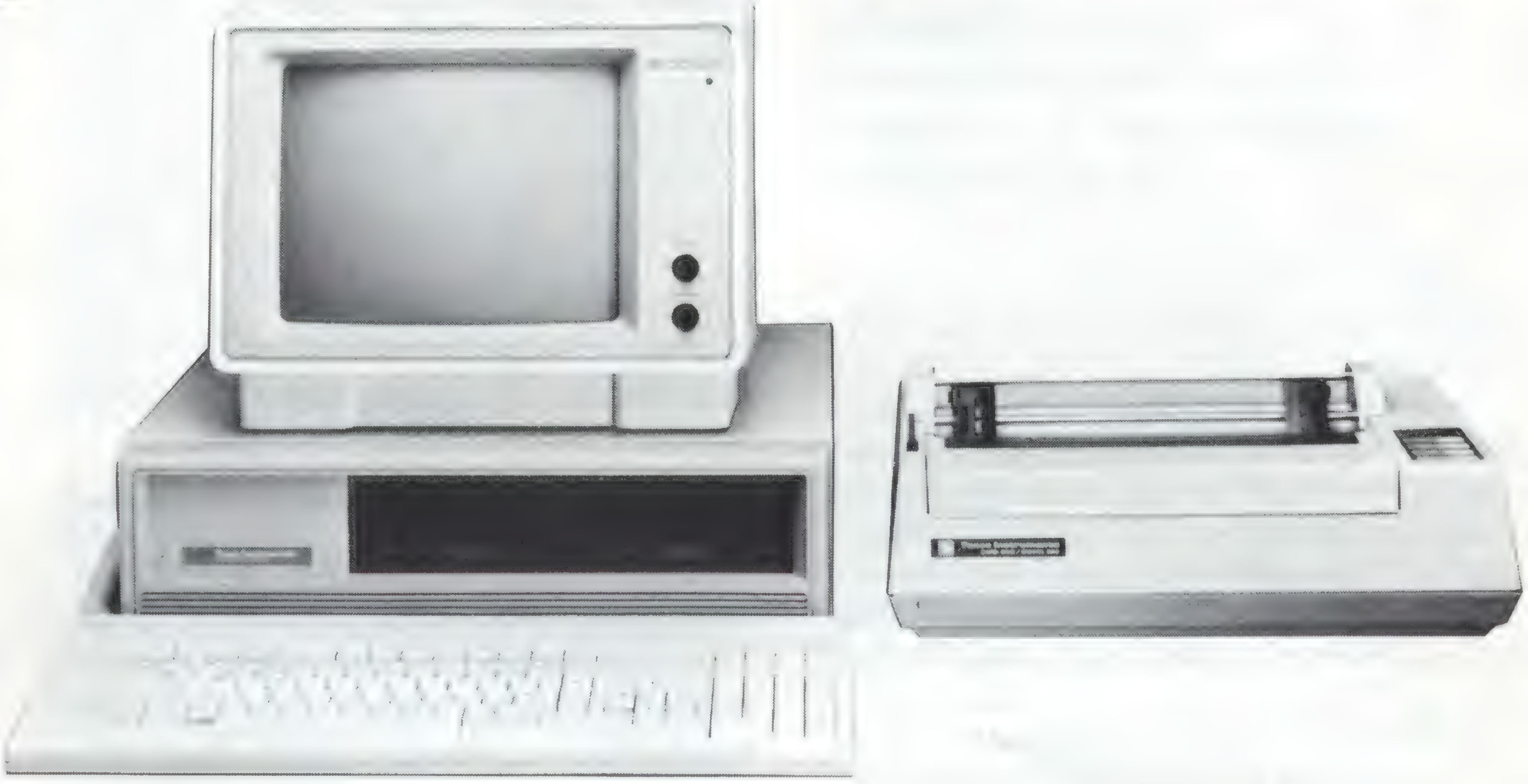
The job opportunities I've mentioned in this column are directly related to computers and the computer industry. I have probably only touched the surface of computer-related businesses. In a later column I will report how many women are using computers to assist them in other businesses or some specific examples of practical home uses for the TI-99/4 and TI-99/4A.

HARDWARE

A TRUE PROFESSIONAL SHOWS ITS COLORS

A COMPARISON OF THE TI PROFESSIONAL WITH THE IBM PC

by Charles La Fara
President, IUG



If you've never owned a camera before and now want to buy one, where do you start?

A visit to the local camera store opens a dizzying world of possibilities — Polaroids, disc cameras, film cartridge cameras, purse-size, full-size, minatures, everything from "aim and shoot" Instamatics to Nikons, even Hasselblads. And the jargon — depth-of-field, ASA, f-stop, focal plane — means little to a beginner who's never owned a camera.

With so many possibilities, most shoppers simply try to narrow their choices to a camera that fills their needs and allows room for growth. Only time will tell if the selection was adequate for future use or if the buyer will later want equipment that offers the precision and versatility demanded by professional photographers and serious hobbyists.

And so it is with microcomputer buyers. Home computer prices are now low enough so that *some* type of home computer is affordable for virtually anyone who wants to learn about computing. To their delight, new TI 99/4 owners have discovered that their computer offers a broad range of capabilities, with dozens of application software cartridges, games, languages, and options such as printers and modems. However, others have found that the applications they need — extended memory, data base management, faster operating speed, etc. — are beyond the realm of the 99/4. While the 99/4 is wonderful for home use, small business usage will require a computer that's a big step up — a personal computer.

The good news is that people who have cut their teeth on the 99/4 no longer have to go to IBM, DEC, Apple, or dozens of other companies for a personal computer. They can now turn again to Texas Instruments. With capabilities that match (and in many cases, exceed) the "industry standards" of the IBM, PC, TI's new Professional Computer features innovations that are certain to make it a leader in the personal computer marketplace.

INTRODUCING THE TI PROFESSIONAL COMPUTER

The basic TI Professional Computer carries a suggested retail price of $2595 and consists of a system unit with 64K bytes of random access memory, a 12" monochrome display, detachable keyboard with separate numeric keypad, and an integral 320K-byte diskette drive. (During the second quarter of 1983, TI offered 256K RAM, a $700 expansion option, at no additional cost with the basic system; at press time, it was uncertain if the "256K Givaway" would continue.) Available options include a second diskette drive or a 5 or 10M byte Winchester disk drive, a 13" color display unit, internal modems with automatic dial and answer capability, and a low-cost dot matrix printer, the TI Model 850.

TI's new Professional Computer features innovations that are sure to make it a leader in the personal computer marketplace.

Both the Texas Instruments Professional Computer and the IBM PC utilize the 16-bit 8088 microprocessor. The machines can be configured so similarly that a casual observer might note very few differences, other than price (in most retail stores, the TI PC is priced $100-$150 lower than the IBM PC). And since TI introduced its machine January 31, many comparisons have been drawn between the two. However, much more than a toss of the coin distinguishes the Texas contender from the IBM PC. This article briefly examines some of the main differences.

A FAST PERFORMER

No matter how classy a microcomputer may appear, it's really performance that counts; i.e., how quickly and efficiently it carries out various operations. Two main things normally affect the performance of a computer. The first is how well it manages the input and output (I/O) operations, including reading from the writing to stored disk files. The second is how rapidly it computes mathematical calculations.

In a test run in early 1983, the TI PC dualed the IBM PC on eight I/O and four compute operations. All were written in MS Basic 1.10 and run under MS-DOS 1.10. Each system used two 5¼" floppy disk drives. Tests were executed in such a way as to allow direct comparisons between the two. Tests were repeated three times and the results averaged.

Results indicated that the TI PC performed identical operations *10.41 percent faster* overall than the IBM PC. The IBM PC came out ahead on only two perations, with a difference of only .5 and 2.5 seconds. On the other hand, the TI PC performed the task of *writing 500 80-byte records* to a sequential file *40.54 percent* faster and finished *1000 library function calls 25.77 percent faster.* Overall, math operations were completed 15 percent faster on the TI PC.

OUTSTANDING KEYBOARD

One of the outstanding aspects of the TI PC is the well-designed keyboard. The TI PC is 17 percent lighter and has 14 more keys than the IBM PC. The extra keys on the TI machine include dedicated cursor control keys (HOME , , ,), two extra function keys, a PAUSE/BREAK key, a LINE FEED key, and several keys duplicated for use with the numeric keypad.

On the IBM keyboard, the cursor control keys are embedded in the numeric keypad; to use them the NUM LOCK key must be released. Since the numeric keypad is disabled whenever the cursor keys are used, it is especially difficult to manuever when using Multiplan and VisiCalc, or when editing data files. With the TI PC, the cursor keys are set to the side in an easily identifiable group with no extraneous keys that could be hit by accident.

The groupings of the keys make it significantly easier for someone to find a needed key. The IBM PC keyboard is crowded and confused, while the TI PC layout is spacious and easy to use. The numeric keypad is also set to the side to distinguish it from others. The arrangement of the 12 function keys is especially useful. They are located across the top of the keyboard in a single horizontal row, rather than in two vertical columns to the side as on the IBM PC. The real advantage of this is that the descriptions of the function keys on line 25 of the screen line up visually with each key. The TI PC has two more function keys than the IBM PC, with the first ten being compatible with the IBM PC. In addition, the function keys are grouped into fours, providing a visual memory of key location.

Another important layout advantage of the TI PC is that the "destructive keys" (INSERT, DELETE, BREAK/PAUSE, PRINT) are located in a separate group, away from the commonly-used keys. On the IBM PC, the DELETE key resides just below the down arrow, which is a particularly hazardous location. Even more inconvenient, the PRINT SCREEN key on the IBM is just to the right of the shift key. An accidental striking of this key ties up all activity while the entire screen is printed.

One of the outstanding aspects of TI PC is the well-designed keyboard. The typewriter portion of the TI keyboard is exactly like an IBM Selectric typewriter ... touch typists will immediately feel at home.

The typewriter portion of the TI keyboard is exactly like an IBM Selectric typewriter, including the L-shaped RETURN key: a touch typist will immediately feel at home on the keyboard. On the other hand, the location of the RETURN keys, SHIFT keys, and UPPER CASE LOCK key is awkward on the IBM PC, slowing down a competent typist and increasing errors dramatically.

The addition of keys dedicated to PAUSE and LINE FEED on the TI PC prevents the necessity for trying to remember the associated control functions at a crucial time.

A convenient feature of the TI PC keyboard is that it powers up with the UPPER CASE LOCK key on, while the IBM PC starts out in lower case mode. Additionally, an LED light reminds the user which mode he or she is in.

A unique method of tactile feedback keyswitches allows the TI PC to be especially quiet compared to the louder fairly irritating clack of the IBM PC. A soft mechanical click and a noticeable release of tension when the key has made contact lets the user know that the key has been recognized electronically.

The last feature unique to the TI PC is tactile identification provided for three important positioning keys. The "5" key on the numeric keypad has a raised dot, and the "F" and "H" keys have vertical indentations, designed to mark these keys for tactile recognition.

HIGH-QUALITY GRAPHICS

Comparing graphics capabilities on these two machines points out two important advantages of the TI PC over the IBM PC. The first advantage is that the quality, defined by the character resolution, color capability, and graphics resolution, is significantly higher than that provided by the IBM. The second is that the overall design of the graphics capabilities by TI allows migration upward without any loss of capabilities or any rewriting of software.

To provide the foundation for the first part of this discussion, it is helpful to separate character generation and graphics generation. Characters can be displayed in color, and this is not considered color graphics. Another aspect of character readability is type font.

Character resolution is defined by the number of dots used, column by row, to create a character. The higher the number, the greater the resolution. The TI PC character resolution is always 7x9, whether monochrome or color. On the IBM PC, character resolution is reduced to 5x7 when a color monitor is used. IBM also uses Serif type font, which wastes the left-most column in the dot matrix on ornamental tails. The TI PC displays letters in Sans Serif (meaning without tails), which makes the characters appear larger and more readable, since it uses the full available character width.

With the TI PC, eight colors are always available once color is added to

TI-99/4A OWNERS

Keyboard Basic • Learn at Home • No Classes

Package Includes - Comprehensive Instructional Information; Game Programs (Kamakaze, Tank Attack, Maze); Educational Programs (Building Block, Addition & Subtraction); Useful Programs (Budget/Checkbook Maintenance, Budget Display; Baseball Stats); Plus More. Entire Package Under $40.00.

For Information and ***Free Program,***

CALL TOLL FREE 1-800-241-6083

AMLIST, Inc. **NO OBLIGATION**

Basic TIPS

4542 Memorial Dr. #202
Atlanta, GA 30032 (404) 292-0576

the system, for both characters and graphics. IBM, on the other hand, offers 16 colors of characters (actually eight colors in two shades each), but *only* if no graphics are used. When color graphics are used, only four foreground colors are available. A choice of either red, green brown, and black; or white, cyan, magenta, and black can be used on a solid background of one of the 16 colors.

The most significant design advantage with the TI PC is that the basic controller remains the same with any monochrome or color graphics set up.

These limitations in character resolution and color choice are compounded by the reduced picture resolution for the color graphics generation with the IBM PC. With the TI, the graphic resolution is always 720 horizontal by 300 vertical dot positions (pixels), and color is never sacrificed for resolution. All eight colors are always available for text and graphics. With IBM, the resolution with color graphics is only 320 x 200, and that is with only four colors. Without color graphics, the highest resolution on the IBM is 640 x 200. Thus, the comparative advantage of the TI PC over the IBM PC for color graphics is 125 percent horizontally and 50 percent vertically. This reflects memory restrictions on storing color information on the IBM PC. Since there are only 2000 cells of alphanumeric information, 16 options are provided for color. For raster graphics, however, memory must be large enough to store information for 64,000 dot positions (720 x 200).

The modular design of faster graphics for the TI PC is an important distinction. As mentioned at first, the TI PC provides a migration path from monochrome to color and to graphics that is missing with the IBM. Each step of the way is an enhancement with nothing taken away. Existing software remains compatible. With the IBM upgrading, one thing is changed out for another, trade-offs are made, and software is no longer compatible.

The most significant design advantage with the TI PC is that the basic controller remains the same with any monochrome or color graphics set up. In the IBM design, a color board replaces the monochrome board, and the duplicate functions (including character generation, bus interface, RAM, scanning circuitry, etc.) are literally thrown away and replaced by new ones. This creates some incompatibility with existing programs. With the TI PC, users start with the CRT Controller, then add color with the 1-PLANE package, and then add graphics with the 3-PLANE graphics package. A monochrome or color CRT can be used at any time, with colors being represented as shades of gray on monochrome CRT. The character resolution (7x9) and graphics resolution (720 x 300) remain consistent also, as does the availability of eight colors as soon as color is added. The column width is always 80 characters.

In contrast, with the IBM PC, users either have a monochrome board with 7x9 character resolution or a color board with 5x7 character resolution, and each has its own controller. With the color board, the choice is either alphanumerics with 16 colors available or the graphics mode with four colors available. In the graphics mode, the machine provides either 40 column mode with color or 80 column mode without color. All along the way, there are trade-offs with the IBM PC, and none of the final options provides the quality and completeness afforded by the well-designed TI PC graphics capability.

A SOLID STATE SOFTWARE BASE

On the day the TI Professional Computer was announced, a full set of general purpose, business-oriented software was already available nationwide. Over 100 programs for word processing, accounting, financial modeling and planning, data base access and management, and graphics were available from leading third-party software vendors such as Ashton-Tate, Information Unlimited Software, BPI Systems, MicroPro, Peachtree, Sorcim, and Microsoft. Programs included such best-sellers as dBase II, the EasyWriter and EasySpeller family, WordStar, and accounting packages from Peachtree and BPI. With so many first-rate programs immediately available, TI PC users did not have to wait for applications software, as is the case with many other new microcomputers.

The TI Professional Computer offers users four industry-standard operating systems from which to choose: MS-DOS™, CP/M™, Concurrent CP/M-86™, and UCSD p-System™. With the addition of Baby Tex™, a softcard supplied by XEDEX Corporation, the machine can also utilize the CP/M-80™ operating system, providing access to thousands of additional programs. Languages supported include Basic, COBOL, Fortran, and Pascal.

While the TI PC is not an IBM-compatible machine, data diskettes that have been formatted on an IBM PC can be read on the TI PC. Furthermore, a Basic program that is saved on an IBM PC can be read and interpreted on the TI PC without any kind of transfer utility,. The Basic program will execute, with some exceptions.

Although the TI PC's software base is not nearly as large as that of the IBM PC (IBM claims more than 1000 programs have been developed for the PC), the Professional Computer does offer users the programs they will most likely need and want. In addition, VisiOn™ and Lotus 1-2-3™ are scheduled to be introduced on the TI PC later this year. To expedite development of third-party software, Texas Instruments has established a software authors program to deal with the hundreds of vendors who are eager to supply third-party software. In time, TI's solid software base should be flourishing with new additions.

COMING SOON: NATURAL LANGUAGE INTERFACE AND VOICE MANAGEMENT

Two options scheduled to be introduced this summer on the TI Professional Computer will give it capabilities that cannot be matched by the IBM PC or any other microcomputer. Texas Instruments has pinned high hopes on a natural language interface and a voice management system. Perhaps more than any other features, these two options could secure TI's reputation as an innovator in the personal computer field.

The natural language interface leads users to information by helping

32K Memory Expansion

ICS 1000
32K Memory Expansion Card
For use in the TI Expansion Box.
Price.......... $130.00

ICS 2000
32K Memory Add On
- This model attaches to the right of the console and also allows the use of other peripherals including the peripheral expansion box.

Price.......... $220.00

ICS 2100
RS232/32K Memory Combination
- Includes parallel and serial interface.

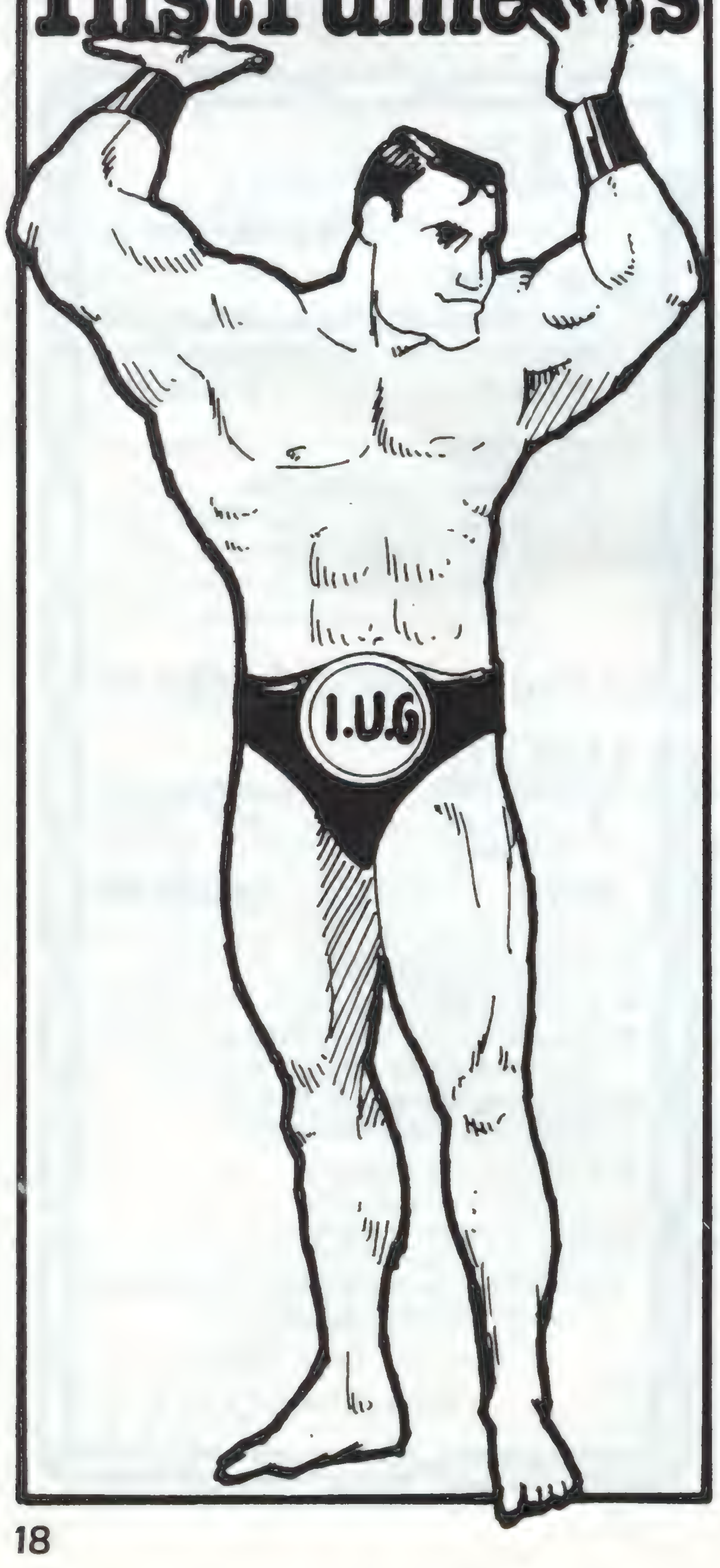
Price.............. $280.00

- TI-99/4A compatible
- 6 month warranty
- Master Card / Visa / Prepaid / COD Utah residents add 5% sales tax.
- Shipping Prepaid in U.S. Allow 2-3 weeks delivery.
- Dealer/Users Group Inquiries Welcome

Intellitec Computer Systems
2337 Bonanza Court
Riverton, Utah 84065
(801) 254-2333

SUPPORT OUR ADVERTISERS

Intelpro
TAB BOOKS
Alpha 2
COMPUTER SERVICES
J&KH Software
MILLERS GRAPHICS
Texas Instruments



them ask questions the computer understands, using common English words and phrases. It is not a separate product in itself, but will be utilized with various applications in order to simplify using these packages.

Texas Instruments has pinned high hopes on a natural language interface and a voice management system.

In using the natural language interface, the video display screen is divided into several windows, each offering a set of words or phrases from which the user selects. The user scrolls to his selection; as the items are chosen, they appear in a separate window on the screen and form a plain English sentence that describes the function to be performed.

Because the natural language interface guides the user through the sentence building process, it eliminates the possibility of syntax mistakes or of asking questions that cannot be answered. Thus, even a user with very little knowledge of computing could ask questions and query a database for information, following the system's prompts. Without this prompting, the user would have to remember sentence structure and acceptable vocabulary.

The natural language interface allows a single request or a series of requests to be processed without having to write a program. A natural language interface to the Dow Jones News Retrieval database, for example, would allow users to quickly build an English sentence instructing the TI Professional Computer to display a particular company's closing stock prices for the past ten trading days. The user could also build sentences requesting information on several stocks simultaneously, current news headlines from the *Wall Street Journal,* and other types of information.

While speech recognition products are available for the IBM PC through third-party vendors, the TI voice management system will combine speech recognition with telephone management for a level of versatility that is vastly superior to other products. Capabilities include storage and forwarding of telephone messages, automatic dialing, telephone answering, and recognition of spoken words and phrases. The system will accept commands that are user-dependent, and it allows the user to speak in complete sentences. It stores 50 words at a time in memory and can access additional words from a disk.

In recognizing and responding to voice commands, the TI Professional Computer uses an innovative Transparent Keyboard™ technique. Application programs designed for use with a keyboard will be able to respond to spoken commands without modifications to the program. For example, the user can control a spreadsheet program verbally.

The voice management system combines the functions of a "smart" telephone, a dictating machine, and a telephone answering machine. It can speed-dial commonly used telephone numbers and re-dial the most recently used number. When the user is away from the office, it will answer the telephone, record the caller's message, and play it back upon request; the user can also call the computer from a remote location and play back any messages.

The TI voice management system will combine speech recognition with telephone management for a level of versatility that is vastly superior to other products.

The voice management system of the future could play a significant role in enhancing communications by serving as a total "message management center." The user could dictate a message or series of messages, then command the Professional Computer to deliver the messages to any number of people by phone or by "talking" to their terminals, saving both executive and secretarial time.

CONCLUSION: IT IS PROFESSIONAL!

The Texas Instruments Professional Computer, far from being just a "me, too" response to the IBM PC, is a well-designed machine that should be at the top of the list when considering the purchase of a personal computer. Its clear superiority in two areas — keyboard and graphics — cannot be overlooked, since these affect the everyday use of the computer. And with planned additions such as voice management, natural language interface, a "mouse" and joystick support, the TI PC offers plenty of room for future growth if Texas Instruments maintains its tradition of innovation. Although the IBM PC may dominate the personal computer market (at least for now), the TI Professional Computer is the clear winner in technical excellence.

(MS-DOS is a trademark of Microsoft Incorporated.
CP/M, Concurrent CP/M-86, and CP/M-80 are trademarks of Digital Reserach Incorporated.
UCSD p-System is a trademark of the Regents of the University of California.
1-2-3 is a trademark of Lotus Development Corporation.
VisiOn is a trademark of VisiCorp.
Baby Tex is a trademark of XEDEX Corporation.
Transparent Keyboard is a trademark of Texas Instruments Incorporated.)

PEEKING AND POKING — TI'S NEW PORTABLE — THE CC-40

By Bill Gronos

9505½ SE 15 #B
Midwest City, OK 73130

It's smaller than a 250 page hardback novel (reference: "The Queen's Gambit" by Walter Tevis - a good book). It's solidly built and reeks of class. It's the Texas Instruments COMPACT COMPUTER 40.

If you are as addicted to computers as I am, you've probably wished you could pack up your 99/4A and tote it about with you. What a great way to pass time in the dentist's waiting room or during a daily commute to work.

But what would you use for a monitor? Trying to pre-empt someone's favorite soap opera with "Enhanced Basic" would likely net you a broken arm as soon as your fingers touched the channel selector. Instead of the dentist's waiting room, you would end up in the emergency room.

And where are you going to plug it in on the bus? My 99/4A "freight train" requires eight electrical outlets — the lights dim when I turn on the system. The 99/4 is definitely not a portable.

Seeing a market developing for portable computers, TI has thrown their hat into the ring along with Tandy, Sharp, Epson, et al. If TI can get some peripherals for the CC-40 on the shelves without their usual delays, they may just have themselves another winner.

HOW PORTABLE IS IT?

Very! It will easily fit in a brief case with lots of spare room and if, like me, you aren't a suit-and-tie type, it will fit handily inside your backpack, foam packing and all. It travels very well.

I took the CC-40 along on a recent two-week business trip. I had often considered putting my 99/4A into a suitcase and taking it with me, but I always decided it just wasn't practical nor worth the risk of theft or damage. The CC-40 is the perfect computer for the businessman or traveling computer addict. I wish I'd had a CC-40 when I went to Saudi Arabia for two months.

Rather than read on my return flight, I uncased the CC-40 at 35,000 feet and added some features to the program I was writing for this column. Through no fault of the CC-40, this wasn't an easy task. The problem was curiosity; The CC-40 drew a lot of attention. I was asked a lot of questions by my fellow passengers, which soon drew the attention of the airline stewardess. As she approached, I wondered if she was going to tell me that except for calculators, using electronic devices onboard an aircraft wasn't permitted. On a previous flight, I had a stewardess confrontation over my use of a computerized backgammon game; my argument that the game was no different than the calculator circuitry ws in vain. It was different this time. The stewardess was very interested in the computer and asked more questions than the passengers did. The attention the CC-40 drew was a bit embarrassing.

Perhaps these computers will become this summer's status symbol, with Izod alligators and Gucci logos featured prominently on the keyboards.

The CC-40 will have far-reaching business applications when TI introduces their battery-operated modem. This will turn the CC-40 into a completely portable "smart terminal". An away-from-home executive can keep in touch with his electronic office from his hotel room or even a phone booth. I've always wished I could access my electronic mail service while I'm travelling — the CC-40 w/modem will make that wish come true.

The businessman's boon may well be the lawman's bane. The data sending capability of a completely portable computer/terminal system could likely be put to good use by drug dealers, bookmakers or anyone else whose "business" requires secrecy. An easily written cryptographic program would make wiretaps virtually useless. Part of the cipher key could be memorized and only entered when the terminal needed to be used, reducing the hazard of compromise should the unit be seized. A one-button memory dump feature would destroy all evidence within microseconds in the event of a "surprise"; modern technology has made the spy's nitrocellulosed-based flash paper pad obsolete. Hmmm...I must be reading too many spy books; let's get back to everyday uses.

Portability even has its uses while you're at home. Until I bought my 99/4A, one of my favorite hobbies was bicycling. Since I spend most of my free time on my computer, my Peaugot has been left to gather dust in the garage. I bought an exercycle to keep in shape, hoping I could pedal it and type at the same time. I never got around to building the special desk that would accommodate four feet of computer with room underneath for the exercycle, but I can easily use the CC-40 while I pedal. You can also sit outside on a lawn chair and get a tan while your computer is figuring tangents. The CC-40 certainly rates top marks for portability.

The 31-character LCD display has very readible quarter-inch high digits and it scrolls to 80 characters. Working with a one line display wasn't as limiting as I first thought it would be. Included in the BASIC instruction set is the PAUSE

ALL command. This will automatically halt the program whenever the display is filled so you can view your text or calculations. Program execution continues when enter is pressed. PAUSE can also specify the number of seconds you want the program to halt, with automatic resumption when the time is up. The resolution of the PAUSE command is about a tenth of a second, with maximum values far beyond the limits of my patience.

> ***The CC-40 is the perfect computer for the businessman or travelling computer addict.***

The maximum line length of 80 characters is accomplished by scrolling the display sideways when the display is filled. Unlike the TI writer and Editor/Assembler, which have 40 character displays and imitate an 80 character line by making a 20 character jump to the next segment of the line, the CC-40 scrolls its display a character at a time. This is far easier on the concentration and makes data entry easier than "window" jumping. Still, some other hand-held computers have multiple line displays, which makes me wish TI had used a similiar display on their portable.

As expected, graphics are very limited. Only seven characters are user definable and you work with a 5x8 grid rather than an 8x8. TI did include a large number of pre-defined, special purpose characters including the greek alphabet and a set of Japanese Kata-Kana characters (which may give a hint of their marketing plans).

TI has definitely got plans to market the CC-40 in Europe. Included in its repertoire of Enhanced BASIC subprograms is "CALL SETLANG". This command selects the language in which system messages and errors are displayed. CALL SETLANG(1) conditions the CC-40 to respond in German and instead of "BREAK" you'll get "UNTERBRECHUNG". Languages other than English and German will be accessed with plug-in modules and the CC-40 manual indicates French, Italian, Dutch, Swedish and Spanish will be available.

The keyboard is of the push button variety similiar to the 99/4(plain). Since I'm a two-finger typist, I found I preferred this style of keyboard because it allows the use of an overlay that can define every keytop. TI Writer has five handy functions that I don't use because I never remember which key they are and since they aren't located on the top row, the slip-in insert doesn't cover them. Proficient typists might have other opinions about the keyboard.

They CC-40 keyboard has 69 keys (compared to 48 on the 99/4) that are laid out in three sections: typewriter keyboard, numeric keypad and a four button section marked "break", "run", "on" and "off". Although it has 21 more keys than the 99/4, it has ten fewer symbols. While tilde, reverse slant and reverse apostrophe are no great loss, others will be missed. Especially the "at" sign (@) and underscore(_). The "at" sign is used as a control character in the Editor/Assembler and TI Writer. I have plans on using the CC-40 for writing articles and assembler programs when I travel, saving them to Wafertape and using the Hex-Bus adapter to transfer them to my 99/4 when I return. Luckily, both the E/A and TI Writer have "replace" functions that will let me substitute the percent sign (%) for the "at" sign with only a small bit of inconvenience.

As compared to the 99/4A, the CC-40 suffers from "wandering" symbols. Both have "shift", "function" and "control" keys, but quotation marks, which were "function P" on the 99/4A, are "shift=" and the parentheses went from "shift 9 and 0" to "shift 8 and 9". Since I'm often switching from one computer to the other, the "hunt and peck" typing I use on the 99/4 becomes the "all points bulletin" and "push" method on the CC-40.

The keyboard only has one shift key, on the left side, and the enter key is where the right shift key would normally be. It was annoying to keep pressing enter by mistake and get "variable not defined" errors, but you get used to it.

Real typists aren't going to like the fact that the mathematics symbols (+ - * /) on the numeric keypad aren't duplicated on the main keyboard. Happy hunting!

In spite of these minor drawbacks, the CC-40 keyboard has several outstanding features. Ten of the keys, (0-9), are user definable and come in very handy for storing frequently used text, numerical calculations or even single line programs. Up to 80 characters can be stored for each keytop. These keys will hold their contents even after you turn the computer off. Simply press [function] [0-9] and your stored text reappears in the display as if you had just typed it in. If you define key 1 to be: "FOR X =1 TO 60:DISPLAY AT(15), X;:PAUSE 1:NEXT X:DISPLAY BEEP", you'll have a 60 second counter just by pressing [function] [1] [enter]. Another key could be coded as a stopwatch, a compound interest calculator or numerous other applications. Forgetful businessmen could find it helpful as a reminder board. User defined keys in no way interfere with stored programs.

The CC-40 has another outstanding keyboard feature: one button BASIC words. Instead of having to type "print" a thousand times in every lengthy program, I simply press "function k". Twenty-seven of the most often used keywords in BASIC can be entered with a single symbol. Whether you're a rated typist or not, this feature really speeds up program entry.

While we're on the subject of BASIC, let's compare the 40's "Enhanced BASIC " to 99/4 Extended BASIC. The following functions have been added to Enhanced BASIC:

FUNCTION	PURPOSE
ACS	COMPUTES ARC COSINE
ADDMEM	ADDS EXPANSION RAM
ASN	COMPUTES ARC SINE
ATTACH	SAVES SUBPROGRAM VARIABLES
CLEANUP	DELETES UNUSED VARIABLES
DEBUG	ASSEMBLY LANGUAGE DEBUGGER
DEG	SETS ANGLE UNITS DEGREES
DELETE	REMOVES SPECIFIED PROG LINES
EXEC	EXECUTES ASSEMBLY LANG PROG FORMAT INITIALIZES DEVICES
FRE	RETURNS MEMORY INFORMATION
GETLANG	CHANGES PROMPT LANGUAGE
GETMEM	RESERVES MEMORY BLOCKS
GRAD	SETS ANGLE UNITS TO GRADS
INDIC	CONTROLS DISPLAY INDICATORS
INTRND	RANGES RANDOM NUMBERS IO SPECIAL PERIPHERAL CONTROL
KEY$	HALTS PROG TILL KEY IS HIT
LN	COMPUTES NATURAL LOGARITHM

The extra memory commands were added to allow better use of the limited memory and to aid in adding assembly language programs and subroutines.

The extra math functions extend the CC-40's use as a calculator and it is excellent for this purpose. I own a TI 58 calculator and found I prefer to use the CC-40 instead. It's 31 column display allows you to keep better track of your long calculations and using variable names instead of register number decreases the chance of making mistakes. Also, my TI 58 will last less than three hours between charges, while the CC-40's batteries are good for 200 hours. The 40's LCD display is a lot easier on the eyes.

Having a built-in debugger is a great aid for one of my favorite hobbies

Now you can buy a disk drive for your TI-99/4A for $400 LESS than you thought you could!

Putting a disk drive on your TI-99/4A® can be an expensive proposition . . . unless you add a Percom Data TX-99™ for a mere $449. A similar TI-supplied disk configuration requires that you purchase a Peripheral Expansion Box, a Controller Card and, of course, the Drive itself. The tab on that little package is a hefty $899!

How about this for an alternative . . . one sleek, plug – compatible disk drive system . . . COMPLETE. No bulky boxes, no extra cards, and most importantly no extra $400!

The Percom Data TX-99 is designed specifically for your TI-99/4A, and utilizes all the pioneering developments that have made Percom Data a reliable leader in the computer industry for nearly a decade.

This single density, single sided, 92K byte (formatted), 5¼" floppy disk drive system permits expansion of your computer at an affordable price. You get ample storage capacity, with the capability for additional growth. Percom Data also offers an add-on or a dual drive disk option.

PERCOM DATA has some excellent reasons why your TI-99/4A needs our TX-99 disk drive system. To find out what they are all you need to do is call our Toll Free Hotline to find out. Call now and we'll tell you and give you the name of a nearby authorized dealer who can explain it just as well as we can. Ask for our booklet **"Reasons Why My TI-99/4A Needs a Percom Data Disk Drive." CALL NOW . . . 1-800-527-1222**

PERCOM DATA
CORPORATION

Expanding Your Peripheral Vision

DRIVES • NETWORKS • SOFTWARE

11220 Pagemill Road, Dallas, Texas 75243 (214) 340-5800 TELEX: 73-0401 (PERCOM)
1-800-527-1222

Dealer Inquiries Welcome

TEXAS INSTRUMENTS 99/4A is a registered trademark of Texas Instruments Incorporated. TX-99 is a trademark of Percom Data Corporation.
COPYRIGHT 1983 PERCOM DATA CORPORATION

— exploring the inner worlds of TI's computer products that they seem so reluctant to tell you about. It made the writing of the program listed on page 37, which required figuring out how Enhanced BASIC is stored in RAM, far easier.

INTRND is a function that would be more useful in Extended BASIC than in Enhanced BASIC, since it is very useful in games. It will give you random integers between 1 and the number you specify. Here is a stock market analysis program for all you wheeler-dealers:

```
100 REM OUIJA STOCK MARKET
    ANALYSIS ALGORITHM
110 OPTION$(1)="BUY"
    :OPTION$(2)="SELL" 120
    PRINT OPTION$(INTRND(2))
    ;" ";
130 FOR X=1 TO 3
140 PRINT CHR$(INTRND(26)
    +64);
150 NEXT X
160 PRINT "PRESS ENTER FOR
    NEXT TIP":PAUSE:GOTO 120
```

If you believe in Fate, this program just may pick you a winner. However, if it comes up with "BUY WCI", you may want to run it again.

The CC-40 has (an) outstanding keyboard feature: one button BASIC words.

I find the DELETE function to be help and hindrance both. The hindrance is not being able to delete a program line just by entering its number — you must enter [function] [delete] [line number]. The slight bother of this function is more than compensated by its usefulness: it allows you to delete entire blocks of line numbers with a single entry. This isn't an easy trick on the 99/4, requiring Extended BASIC (for the MERGE function), a disk drive and the right software. Any of you who have pressed the sequence [function] [down arrow] [function] [erase] ...ad infinitum, ad nauseum, as often as I have will appreciate this feature.

Of all the extra functions that Enhanced BASIC has that Extended BASIC doesn't, the one that is of greatest value is KEY$. Don't confuse this with CALL KEY, which both BASICS have. KEY$ can be used as a string variable in any expression and causes a program to halt until a key is pressed. Let me illustrate the usefullness of this function by comparing two simple programs:

```
100 REM PROGRAM TO DISPLAY
    KEYS AS THEY ARE
    PRESED-EXTENDED BASIC
    VERSION
110 CALL KEY(0,K,S)
120 IF S=0 THEN 110
130 PRINT CHR$(K)
140 GOTO 110
100 ENHANCED BASIC VERSION
    OF KEY PROGRAM
110 PRINT KEY$
120 GOTO 110
```

As you can see, KEY$ is a handy function.

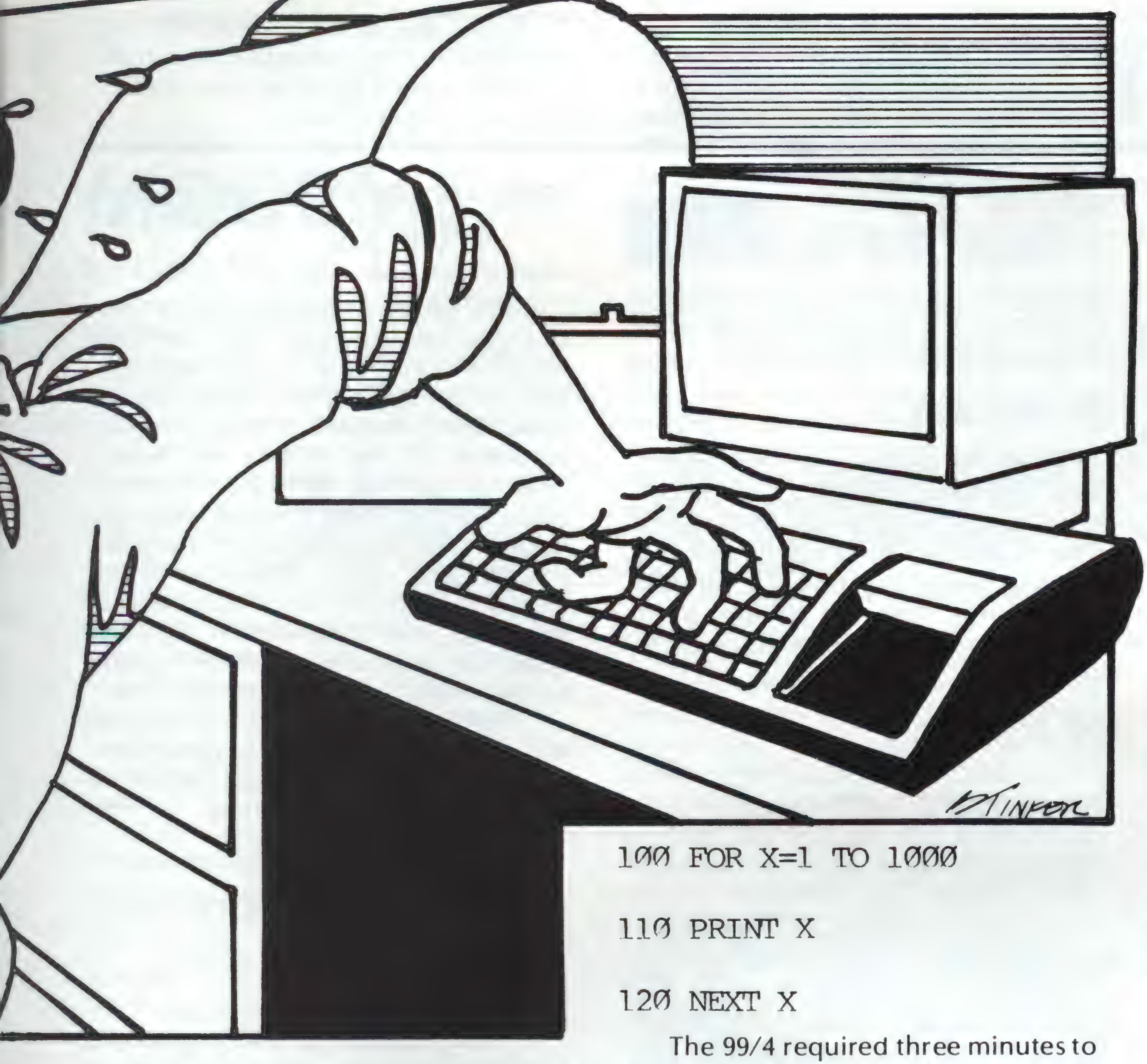
Now let's look at the other side of the coin; what does Extended BASIC have that Enhanced BASIC doesn't?

Well, since the CC-40 doesn't have a joystick port, there's no need for a CALL JOYST function. Likewise, since there are no Sprites, there are no sprite commands. The following graphics functions would be of little use in the CC-40, so they were omitted: CHARSET, CHARPAT, COLOR AND GCHAR. There are no speech functions. If you want sound in your Enhanced BASIC program, you have to be content with simple beeps using lines like 100 DISPLAY BEEP BEEP BEEP.

Three useful Extended BASIC functions did get left behind: MAX, MIN and REC.

There are many more functions in the CC-40 that are too numerous to explain in a single article. Suffice it to say that this small computing marvel is not a stripped-down model. It gets top marks for programming power.

The CC-40 is no slacker on the technical side either. I was unhappy to learn that it does not belong to the "990" family, which means I'm going to have to learn another Assembly language, but there is good reason for this: battery life. The central processing unit (CPU) is a 2.5 MHz TMS70C20 microcircuit and was obviously chosen because of its CMOS architecture. CMOS stands for complimentary metal oxide semiconductor. CMOS' main advantage is low power consumption. I'm still on the original set of batteries. TI claims a 200 hour battery life and they might have understated it. Two hundred hours equates to 25 days of constant eight hour use. No telling how long the constant memory would last if the unit were never turned on.



I got to wondering if the constant memory was the type that needed no current at all to store data. Such memories are called EEPROMs (electrically erasable programmable read only memories). To check this out, I pulled out all the batteries for a few seconds and then replaced them. The contents of memory remained intact. Further experimenting showed that the memory would be lost after about four minutes without batteries installed. Thus, the memory does use current, but it doesn't use much. Since there is a low battery indicator on the CC-40, and you have four minutes when batteries can be left out with no ill effect, your stored programs will remain in memory even if you change the batteries and be ready to run as soon as you turn the unit on. The CC-40 has a very respectable 34K of ROM for storing the system monitor and BASIC interpreter. There is 6K of built-in RAM memory with about 5700 bytes of RAM available for user programming. Add on memory cartridges will allow RAM expansion up to 18K.

Unlike the CPU in the 99/4, the CC-40's brain is an eight bit microprocessor. How does this affect the speed of execution? Well, it should definitely lag behind in the math department, so I ran a few simple programs to test this out.

First, the "idiot benchmark" was tested:

```
100 FOR X=1 TO 1000

110 PRINT X

120 NEXT X
```

The 99/4 required three minutes to run this simple program, but the CC-40 did it in a mere 44 seconds. The reason for this is no mystery; the CC-40 doesn't have to scroll a memory-mapped monitor screen nor is time spent in Graphics Programming Language (GPL) interpretation. Having the display memory space directly available to the CPU gives the CC-40 a big software advantage when programs require extensive printing.

The display speed is a big plus, but could the CC-40 hold its own in mathematical computation?

```
100 FOR X=1 TO 50

110 PRINT SIN(.7853981634)

120 NEXT X
```

This program took 16 seconds on the 99/4 and 10 seconds on the -40. If we change line 110 to Y=SIN(.7853981634), both computers will run the program in about eight seconds. Clearly, it is the printing time that is making the CC-40 appear to be quicker than the 99/4.

Let's put a fairly complicated math expression into the test. What would $25,000 earn at eight percent interest compounded daily for a year? Change line 110 of the above program to:

```
110 Y=25000*(1+.08/365) 365
```

Since this program has no printing and is heavily mathematical, the 99/4 shows off its number crunching prowess and turns in a time of 13 seconds while the CC-40 uses 28 seconds — more than double the time.

Overall, the CC-40 is not as fast as the 99/4, but it is plenty fast enough for the purpose for which it was designed.

While the CC-40 is very advanced technically, the internal structuring is far simpler than the 99/4. By internal structure, I'm referring to how memory is allocated and high-level programming languages are implemented. The 99/4 internal memory handling is very complex. It has three memory systems: graphics memory(GROMS), video display processor memory(VDP RAM) and central processing unit memory (CPU RAM or ROM). The 99/4 BASIC programs are stored in VDP RAM — the system console contains a mere 256 bytes of CPU RAM; the 16K is VDP RAM. The 99/4 is doing constant memory shuffles when a BASIC program is executing.

The CC-40 has only good 'ole, easy to understand CPU RAM. This fact, combined with the PEEK and POKE functions allows you to do many programming shortcuts that are impossible in 99/4 console BASIC. The CC-40 BASIC program on page 37 illustrates one of these tricks.

FAST FULL-SCREEN
DATA PROCESSING
WITHOUT
DISK OR EXPANSION
WITH THE
MINI EDITOR!

At last! A professional-type data processor for home-scale use with the TI99/4(A). ASSEMBLY LANGUAGE program for instantaneous editing of data as you review it on a FULL-SCREEN DISPLAY. Save and load data up to 12K long at 4K PER MINUTE. Combine texts in memory. Also offers complete formating of texts for printing, with automatic word wrap and line centering, right justification, many more useful features designed to give you total control over printer. Great for all word processing, inventories, bookkeeping, catalogs, lists, etc. Demonstrated at the Pittsburgh Users Group. THE MINI EDITOR REQUIRES ONLY A CASSETTE RECORDER AND THE MINI MEMORY.
Write for a free brochure or send $25.00 check or money order for cassette and manual to:

ADVANCED SOFTWARE
181 Carnegie Av.
Clairton, PA. 15025
PA residents add 6%

Suppose you wanted to write an inventory control program where you could input an item number and retrieve supply data and your product numbers were five digits long. With a large product line, access speed could be a big problem with such a program. Inventory statistics could be stored in DATA statements and you could do a read and compare to find the desired product. Part of your program might look like this:

```
220 INPUT "ENTER ITEM NUMBER"
    :NUMBER 230 READ
    PRODUCT,COST,QUANTITY

240 IF NUMBER=PRODUCT THEN
    300 250 IF NUMBER=
    "999999" THEN 400

260 GOTO 230

10000 DATA 10123,24.95,15

10010 DATA 10124,9.95,1123

11000 DATA 11123,45.95,8
```

One way to speed up the selection process is to group item numbers systematically under line number sections and RESTORE the data to a particular section, decreasing the number of comparisons required.

Just think if instead of RESTORE 10000 you could use a variable in the restore statement, as in RESTORE NUMBER. The BASIC line number could be the product number, which besides saving time would decrease the memory needed. The data in the above example would then become:

```
10123 DATA 24.95,15

10124 DATA 9.95,1123

11123 DATA 45.95,8
```

Your line number will take up the same memory space whether it be 1 or 32000. This is a far superior method, but RESTORE X just isn't legal.

BASIC, however, is an interpreted language. Each statement is re-evaluated each time it is executed. The POKE function allows us to "diddle" the memory in which our BASIC program is stored. What would prevent us from changing a line such as 180 RESTORE 1000 to 180 RESTORE 10123 jsut before the line is executed? NOTHING!

I have used this method in 99/4 BASIC with the Minimemory function POKEV (poke video display memory — remember, 99/4 BASIC programs are stored in VDP RAM) and it works great. It requires knowing how BASIC stores a particular line and finding the addresses that contain the 1000 in RESTORE 1000. Don't go looking for the ASCII string for "RESTORE" in memory, 'cause you're not going to find it. BASIC programs are "crunched" and any function word is represented by a single byte value.

Briefly, the technique I use is to create a single line program like:

```
100 REM ZCZC
```

While I'm not going to find "REM", I will, with time, find "ZCZC". I picked that particular string becaue it isn't likely to be duplicated by accident within a program. Once you find the general memory area, you use another short program to decrypt the line you want to study:

```
100 REM ZCZC

110 RESTORE 1000

120 REM ZCZX
```

Once you know how and where RESTORE 1000 is stored, you will be able to convert it to RESTORE 10123 or any other line number. It is then only a short step to having your program alter the line based on a variable value and, viola!, you effectively create a RESTORE X function.

Instead of an inventory program, I built a quick access "address book" program around RESTORE X. This program is given at the end of this article. It's main feature is that you only have to key in the minimum amount of letters needed to make a name unique. Here is an example that will work with the DATA statements I've included in the coding. The entries you press are shown in square brackets:

```
[run]

[enter]

ENTER FIRST LETTER

[C]

CARTER; JACK

[H]

CHRIS CROSS 123-4567

[A]

CHARLIE LAFARA 948-1023
```

Since this was the name that you wanted, you press [enter] and the street will be displayed and press [enter] again to display city and state.

The DATA statement format is:

```
NAME AND PHONE #,STREET,CITY
    STATE ZIP
```

The length of each item is flexible and you can use more than one data statement. The line DATA statement line number for a given name must be three digits preceded by the alphbetical sequence of the name's first letter. "Adams"could be 1001,1010,1234 etc. It could not be 10000 because the tenth letter of the alphabet is "J". I suggest you put your names into order by the frequency that they are used, within a particular letter's subsection. This will speed the retrieval time, which is nearly instantaneous for each letter pressed.

I've allowed a dual entry option that let's you select by first or last name without having to entirely duplicate all the data. The alternate format for the second entry is:

```
NAME, ,LINE NUMBER OF DATA
    STATEMENT
```

The " " symbol tell the program the full set of data is elsewhere and it does another "RESTORE X" to the line number that follows the " ".

Novice programmers should note the slick use of the ON ERROR function to alleviate having to put in REM DATA Z, etc. type lines when no names begin with that letter. Without the first line, the program would halt with a bad line error should a key be pressed for which there is no data.

One caution. Since precise memory locations are being altered, the program format must have exactly the same number of bytes up to the last RESTORE statement. To check the program entry, use the following commands directly from the keyboard:

```
CALL PEEK(8051,X,Y)

PRINT X,Y


CALL PEEK(7798,X,Y)

PRINT X,Y
```

Both prints must produce "3 232". If they don't, the program is entered incorrectly and running it could likely cause loss of the program by altering a critical portion of a line with an incorrect POKE.

MODEMS

By Dana Nichols *Managing Editor*

"Modem" is not in the dictionary. Maybe it should be.

Originally available only from behind Ma Bell's skirts, the modem has come into is own since its "emancipation" by the Federal Communications Commission in 1968. More and more uses are being discovered for the modem — but just what is a modem, and how does it work? And more importantly, how can it aid the small business or home computer owner?

A modem, or modulator-demodulator, transmits serial digital data from a computer, translates (or modulates) the data, and sends the modulated signal over the telephone lines.

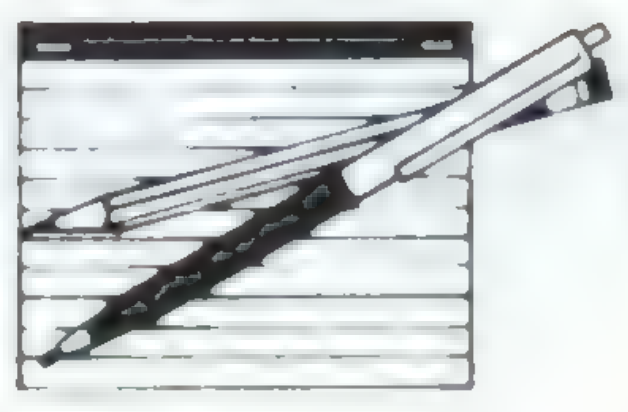
The modem not only modulates, but demodulates. Meaning, receiving signals from another computer over the phone lines and translating them into serial digital information in your computer.

It was inevitable. Businesses turned to computers in an effort to be more cost-productive and efficient. It was just a matter of time before they found a quicker way to send great amounts of information over great distances. Enter the modem.

To someone with little knowledge of them, modems could come from a world beyond. However, a little research and understanding of modems and how they differ from one another could result in an entire new field of expansion for a small business or home computer owner.

The modem began as a child of the Bell system. Only Bell system supplied equipment was available, and heavy telephone tariff restrictions were applied. On June 26, 1968, the Federal Communications Commission handed down the Carterfone decision. Although the FCC permitted the telephone company to protect its networks, non-Bell manufacturers produced their own line of equipment and modifications for use with the Bell telephone network.

The final blow came in 1977 when the FCC permitted manufacturers to develop their own protective circuitry. This replaced Bell's Data Access Arrangements, and enabled manufacturers to integrate their protective circuitry into their modems so end users could connect the modem directly to the telephone lines.



With the introduction and addition of the microprocessor based modem in the 80's, these "intelligent" modems, which have on board random access memory (RAM), can automatically perform functions prescribed by a host computer, thereby eliminating, in some cases, the need for manual operation.

To better understand modems, an insight as to how they differ from one another is helpful. Modems differ in the following areas:

1. Transmission speed through telephone lines. This factor is critical when selecting a modem. Although private networks can be developed, they are usually very expensive. The cost of a private line can be avoided by using existing telephone lines. However, using these public lines slows the transmission rate considerably from 300 to 4800 bit/sec., compared to 2000 to 9000 bit/sec. via a short haul modem, sometimes used with private networks.

2. Distance between communication sites. Relative to transmission speed, distance is also a significant factor considered when choosing a modem. Short haul modems are usually used for communication within 50 miles. These relatively inexpensive modems can operate at speeds of 2000 to 9000 bit/sec.

If distance is not a factor and the modem is to operate over telephone lines, a voice grade or voice band modem is needed. One drawback of using this system occurs when transmission is garbled, or an error has been made. Highly-sophisticated modems have error-detecting features that automatically catch and correct mistakes.

3. Transmission direction — one-way or two-way. Some modems are limited to one-way transmission. Simplex communication involves transmitting data to a site, but not receiving data from that site.

Usually, however, two-way communication is needed. Half duplex modems are capable of transmitting data in both directions; however, simultaneous transmission is impossible. Full duplex enables both transmitters to send data simultaneously. In addition, a full duplex modem may also be capable of echoing received data back to the sending computer for a transmission accuracy comparison.

4. Type of connection. A telephone interfaces with a modem in one of two ways: acoustic, or direct connect. Acoustic modems can be used anywhere, and are ideal for the businessman on the go. Simply place the telephone receiver in the cradle and transmit.

Direct connect modems are plugged directly into the telephone wall jack. An advantage of this type of modem is that outside noise cannot creep into data transmissions as easily as with the acoustic-type modem. Data is less likely to be garbled and more likely to be error-free.

5. The attention/independence factor. One of the more attractive aspects of modems is that some are capable of operating independent of their host computers. More and more, highly-sophisticated modems have this feature. The modem uses a clock/calendar to automatically send messages stored in its RAM at times prescribed by the host. For example, the host computer can program the modem to transmit data at 11:01p.m., thereby using lines at the telephone company's lowest weekday rates.

Another attractive feature is the auto-answer, which enables unattended data transmissions to take place. Examples of this type of transmission include electronic mail and electronic bulletin boards, wherein the computer collects incoming messages without the need for an operator.

The price range for modems is variable. Direct-connect modems are available for as low as $110 or less, with acoustic couplers available for $150 and higher.

A factor affecting the market involves increasing baud rates for reasonably-priced modems. Until recently, the standard rate for modems was 300 baud, while the more efficient 1200 baud modem was reserved for more sophisticated systems that usually required long distance connect time.

Now, 1200 baud systems in the $500 to $700 range are more attractive to consumers, and they are finding that the unit pays for itself in a relatively short period as a result of shorter connect time. One of the more popular and versatile of these 1200 baud modems is the Hayes Smartmodem, which has many unique features such as autobaud, allowing it to determine at what speed a second computer is sending its signals, and then make adjustments; the option of either pulse or tone dialing, making it compatible with both rotary and push-button phones; and positive dialing detection, allowing it to ring a number as soon as the line is ready.

The modem is a fascinating yet simple device with vast capabilities. Just as

(Con't. on page 44.)

DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES

PRICE BREAKTHROUGH

Super Sale on New Disk Drives

Starting at **$199.95 complete!!**
with Power Supply and Case.

Tandon — Siemens — Remex — MPI — Teac — Shugart
single sided 40 track — dual sided 40 track
single sided 80 track — dual sided 80 track
for
RADIO SHACK[1] — HEATH/ZENITH[2] — APPLE[3]/FRANKLIN[4]
IBM/PC-TEXAS INSTRUMENTS[6] & MOST OTHER COMPUTERS

Drive a Hard Bargain!!™
8 M.B. - 12M.B. with Power Supply Case, Cables & Software
Complete Systems . . . . from $1,295.00

Amazing Special!-dual sided 40TK or 80TK drive with Power Supply and Case
and Our Special Warranty - Starting at $Call

TOLL FREE ORDERING	**GENERAL AND TECHNICAL**
1-800-343-8841	**1-617-872-9090**

Model I/III/IV **Drives** (0 1 2 3)	*starting at* ***$175.00***
Color Computer Drives (0 1 2 3)	*starting at* ***$Call***
Apple/Franklin Compatible Add-On Drives	$229.95
Apple/Franklin Compatible Drives with Controller	***$299.95***
Model I/III/IV Memory Upgrade	*starting at $Call*
Printers — Daisywheel/Dot Matrix	$Call
Diskettes	**Quantity** Priced from $17.00
Cases and Power Supplies — (Single-Dual-**1/2 Height**)	starting at $49.95
Printer **Buffers** 8K to 512K	starting at $143.95
Percom Double Density Controller (Model I)	$Call
Holmes Model I/III Speed-up Mod-VID/80	*starting at* $90.00
Gold Fingered **Edge Card Extenders**	*starting at* $13.00
Cables — Printer/Disk Drive	*starting at* $25.00
DOSPLUS	***$Special prices***
Repair Services Now Offered for Disk Drives— *Fast Turn-a-Round*	$Call

One Year Warranty Available on all Drives!

SOFTWARE SUPPORT, INC.

One Edgell Road, Framingham, MA 01701 (617) 872-9090
Hours: Mon. thru Fri 10 am to 6 pm (E.S.T.) Sat. 10 am to 5 pm

Dealer inquiries invited.

Canada
MICRO R.G.S. INC.
751, CARRE VICTORIA, SUITE 405
MONTREAL, QUEBEC, CANADA, H2Y 2J3
Regular **Tel. (514) 845-1534**
Canadian Toll Free 800-361-5155

TERMS:
M.C./Visa/Amex and personal checks accepted at no extra charge.
C.O.D., please add $3.00.
Shipping: Please call for amount.

[1] ™TANDY CORPORATION
[2] ™ZENITH DATA SYSTEMS
[3] ™APPLE COMPUTER CORP.
[4] ™FRANKLIN COMPUTER, INC.
[5] ™IBM CORPORATION
[6] ™TEXAS INSTRUMENTS

© Copyright 1983

NEW ACTION! ACTION! ACTION!

CUBIT

Reviewed by Charles LaFara

Just as the International 99/4 Users-Group had predicted, third-party vendors are now beginning to produce high-quality software for the 99/4 home computer. We here at the Users-Group have just recently finished reviewing a copy of a new game from Artios Software. The game is called CUBIT™, and the game's action is based on a well known arcade game involving jumping from the top of one cube to another while remaining in the field of play. CUBIT is the result of the corroboration of Jack Carrel and Bill Gronos, names which you will recognize as experienced Assembly level programmers due to their work here at the International Users-Group. The game is written in Assembly Language and as a result there is lots of action and suprises.

Where most video and computer games require the player to move with as much speed and dexterity as possible, this game offers an alternative. When playing CUBIT, many times it is wiser to sit where you are and wait for the proper time for your next move. We will let you decide for yourself. The graphics in CUBIT are excellent but as you have seen in the past, graphics do not always make the game. CUBIT offers to its owners not only action but also pure entertainment.

The main character in the game is called a BIT, and gameplay involves BIT jumping from one cube to another while changing the color of the tops of all of the cubes to a certain color, depending upon the screen level in which you are playing. This is not always as easy as it may seem because while you are trying to accomplish this task, strange and bizarre characters will try to impede or halt your progress.

The main enemy, BIT—BUSTER, is a vicious sort, and if you should jump the wrong way, you will become a victim of the fiery pit, located at the pyramid's base.

The amount of activity on the screen is representative of the quality of a game that can be developed when Assembly Language is used. There are multiple screens provided which progressively increase in speed and complexity. For the more experienced player an option will allow you to skip earlier levels and receive bonus points for accepting the challenge of the advanced screens. CUBIT also allows for two player contests like many arcade games where players are allowed to alternate turns to achieve the highest possible point total. One feature unique to CUBIT is that several of the program controls have been moved to the joystick for your convenience, such as game resetting and level selection. CUBIT is being offered in three versions which include Extended BASIC, Mini-Memory and Editor Assembler. Each of these versions may be purchased either on diskette or cassette. If you do not have the Mini-Memory module a 32K memory expansion will be required for both the Extended BASIC and Assembler version.

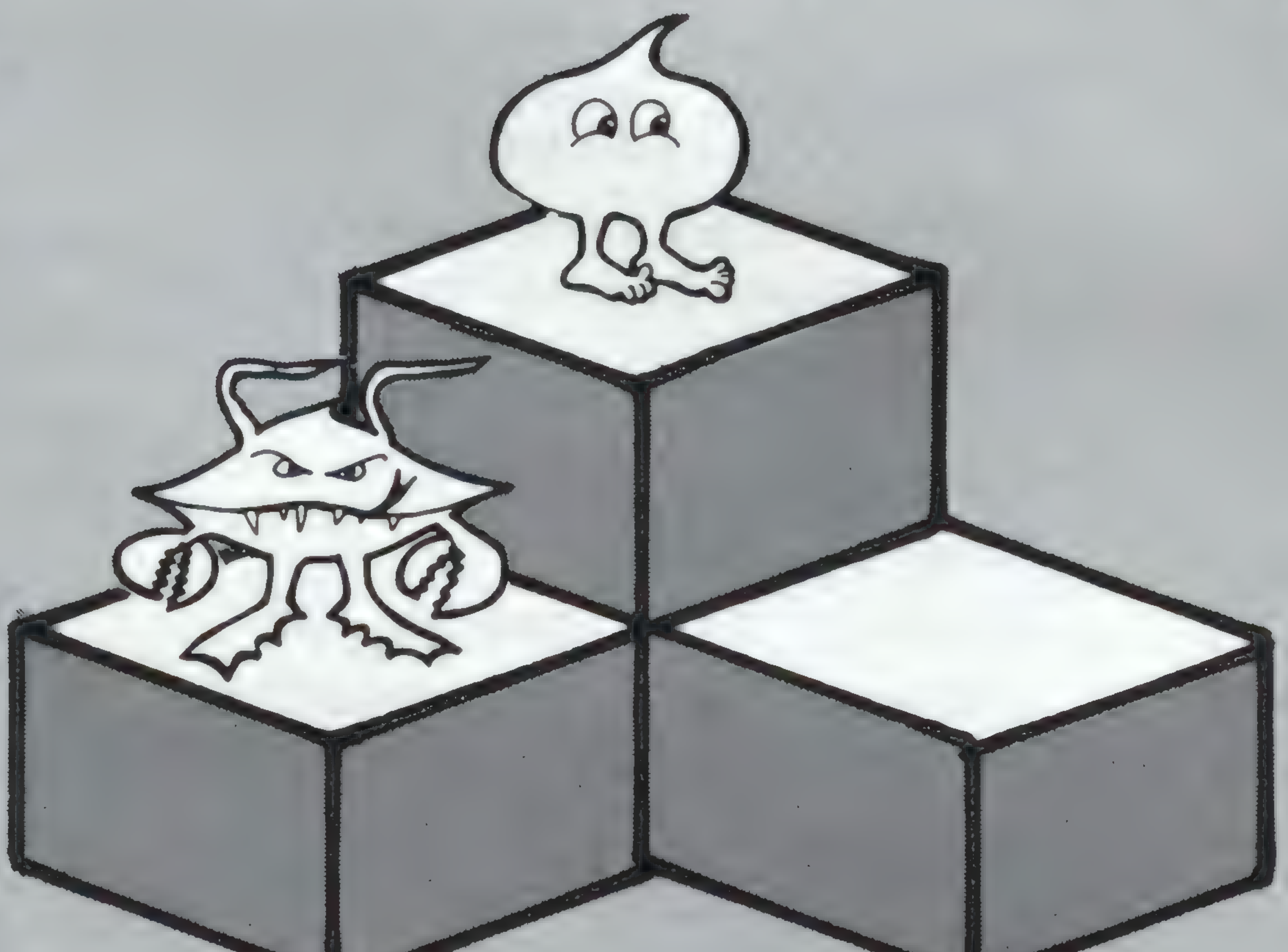
We are very pleased with the effort and forethought that has been put into this action-packed game and look forward to additional releases from Artios.

Artios Presents:

CUBIT™

The Best Game Action Ever Presented on the 99/4.

Written by Jack Carrel and Bill Gronos



Specify the Version you need:
Mini Memory on cassette
Editor Assembler/Extended BASIC on disk

Prices:
Disk Version $23.95
Cassette Version $19.95

Send check or money order to:

Artios
3211 N.W. 26th Street
Oklahoma City, OK 73107

Dealer Inquiries Welcome

The TI Computer Advantage Club. Courses for the whole family.

Enter the fascinating world of the home computer. It's easy, affordable and fun. We offer hands-on computer training for the whole family — even pre-schoolers.

Computers for Early Learners $35
Pre-schoolers gain first exposure to computers. 4 hours.

Children's Computer Awareness $49.95
Introduces children to the way computers work. 8 hours.

Programming Discovery in TI LOGO $49.95
Children explore geometrical, mathematical and logical concepts and develop programming skills. 10 hours.

Programming Discovery in TI BASIC $49.95
Children explore programming concepts and logic in TI BASIC. 10 hours.

Adult Computer Awareness $49.95
Introduces home, business and educational uses of computers — and programming. 8 hours.

BASIC Programming for Adults $75
Hands-on programming instruction in TI BASIC. 10 hours.

TI Extended BASIC $75
Advanced programming instruction with disk system and printer. 8 hours.

TI Writer $49.95
An introduction to word processing. 5 hours.

Microsoft™ Multiplan™ $95
Introduces the uses of an electronic spreadsheet. 8 hours.

To enroll, call toll-free for times and locations.

Ask about our discounts and gift certificates.

Major credit cards accepted.

1-800-858-4069

8 a.m.-8:30 p.m., CDT
(12-4:30 p.m., Sat.-Sun)

TEXAS INSTRUMENTS

Creating useful products
and services for you.

©1983 TI

221348-R2

SOFTWARE

PLATO

COMPUTER BASED LEARNING COMES HOME

By Dana Nichols, Managing Editor

In the beginning, one gained wisdom by learning from another. Gradually, "learners" began to outnumber "teachers" and the classroom was established.

Then came the age of computer technology; computers were added to the classroom and the students came to learn. Now, with the introduction of PLATO™, our educational process has come full circle; we've returned to the ideal one-to-one basis. The student, however, no longer comes to the computer...the computer comes home to the student — and the student learns.

In mid-October of 1982, Control Data Corporation (CDC) announced that it would be producing courses for a variety of microcomputers from its PLATO library. The courseware would operate using the Texas Instruments 99/4A, Atari and Apple microcomputers. William C. Norris, founder of Control Data and chief promoter behind his firm's $900 million investment in PLATO, was opening the door of Computer Assisted Instruction and letting the personal computer owners have a peek inside. On May 6, Control Data made an extraordinary announcement: TI and CDC had reached an agreement whereby TI secured rights to 108 PLATO courseware packages developed for elementary and secondary school levels.

> **"We both have strengths in different areas. We're excited they've introduced it."**

While Control Data has been developing and publishing courseware for over 20 years, Texas Instruments has directed their computer products toward the consumer market. Bruce McGraw, assistant manager, Computer Based Learning for the Computer Group, TI, Inc., said he feels the combination of talents will be successful.

"We both have strengths in different areas," he said. "We're excited they've introduced it."

Susan Busch, Public Relations Specialist for CDC, said the reason Control Data chose TI to receive exclusive rights to PLATO was because when marketing aspects and research concerning PLATO were considered, "TI looked like the best place for us to go."

PLATO, a disk-based product, requires the following equipment: TI 99/4A Home Computer, console, TI disk memory system, memory expansion, PLATO interpreter cartridge, and PLATO program packages chosen.

Consisting of 430 programs, PLATO's variety of courseware includes reading, math, and language arts, including poetry and literature. In addition, the programs encompass physics, chemistry, earth sciences and biology, as well as social studies such as geography, economics and behavioral science.

McGraw said a significant part of PLATO is the interpreter package, available for $49.95. The package includes a cartridge, survey diskettes, and a parent/teacher guide. The survey diskettes are, in effect, pre-tests to determine the child's level at which PLATO will prove useful, and also determines individual areas in which the child may excel or experience difficulty.

The burden is on the consumer to determine which programs will be the most beneficial, McGraw said. However, if the consumer understands the interpretations determined by the interpreter cartridge, they can choose programs at levels the student is most capable of learning.

PLATO courseware is divided into two skills levels: basic skills involving grades three through eight, and high school skills, concerning grades nine through 12.

McGraw said the general basic skills motif is one of progression, fed at the proper rate at which learning should occur.

"Each lesson builds on itself," he said.

The high school level programs are geared toward high school-age learning; in addition, they are developed with GED requirements in mind.

McGraw said he hoped PLATO would "penetrate the adult world" and enable adults lacking high school diplomas to fufill their personal educational requirements.

McGraw noted that while every PLATO package contains a certain number of lessons, each lesson contains both a tutorial, and drill and practice aspect. In the tutorial portion of the lesson, instruction is provided to the student; the second portion of the lesson enables the student to demonstrate what he or she has learned.

Other educational programs lack both aspects incorporated into a single lesson, he said.

"Some are tutorial, and some are drill and practice, but not both."

After skill levels are established using the PLATO interpreter, the consumer can choose from the 108 packages, each available for $49.95. Each program is described in the software brochure included in the package.

McGraw considered the price of PLATO courseware an advantage.

We think we've made PLATO affordable," he said.

Previously, the only manner in which one could use PLATO was by scheduling an appointment to bring the student to a mainframe computer. The

PLATO LIVES. In TI's Home Computer.

If you want to see your kids do better in school, it's time they met PLATO™ from Texas Instruments. PLATO Basic Skills and High School Skills courseware is the most extensive computer teaching system ever developed for kindergarten through 12th grade. Until now, it was only used in schools to give children a special edge–but now they can use it at home–*exclusively* on the Texas Instruments 99/4A Home Computer.

The PLATO system, developed by Control Data, uses proven methods and techniques that make learning so interesting you may have a hard time getting the kids away from the computer. And they'll be learning at their own pace, from a machine that never criticizes; that builds on their newly acquired knowledge; that rewards them with a real sense of accomplishment.

PLATO Basic Skills and High School Skills courseware offers all the subjects a child needs. It teaches math, reading, social studies, grammar, science–more than 108 essential courses that build the foundation of a solid education.

Take PLATO home. And introduce your kids to the knowledge that lives in the Texas Instruments 99/4A Home Computer.

For more information, please call toll free (800) 858-4565.

Creating useful products
and services for you.

TEXAS INSTRUMENTS

Copyright © 1983 Texas Instruments

PLATO is a trademark of Control Data Corporation, U.S.A. Copyright © 1982 Control Data Corporation. All rights reserved. PLATO courseware is manufactured under license to Texas Instruments Incorporated.

PLATO COURSEWARE

student was then charged a fee according to the amount of time spent studying at the computer. McGraw said he felt the TI Home Computer PLATO courseware was better.

"The computer is an infinitely patient tutor, and is available whenever and wherever chosen." he said.

Another advantage of computer assisted instruction is its aspect of individualization.

"The branches (of instruction) occur in the program, " he said, "and the students go at a pace at which they can respond."

PLATO is now being used to teach children of the Chippewa Tribe their ancient tribal language, Ojibwa.

McGraw also believes in the quality of PLATO courseware.

"PLATO has been evaluated and tested, by CDC, with students," he said.

McGraw said TI hopes that PLATO will be incorporated into school systems, and thinks that curriculum-based programs, which offer a high level of flexibility, will be a powerful educational tool.

McGraw compared PLATO courseware to a set of encyclopedia, noting that while all the information in an encyclopedia may or may not be desired by the customer, he must pay for the entire set or edition. The PLATO library of educational courseware, on the other hand, enables the consumer to personalize his PLATO encyclopedia to fit his needs. Costs are held at a minimum, while the student learns — at home — to the limits of his capacity.

Meanwhile, Control Data is finding other fields of study in which PLATO courseware can be applied. PLATO is now being used to teach children of the Chippewa Tribe their ancient tribal language, Ojibwa.

The one-hour programs follow a story line depicting typical events in an Indian's life. The story lines were developed using information provided by tribal elders.

Learning takes place at the Lac Courte Orielle Reservation schools in Reserve, WI. The program began in November 1980.

The programs were developed by tribe member Roger Thomas, who holds a doctorate in anthropology, two authorities on the Chippewa language, and were approved by tribal members.

But PLATO is not just for children; some of the programs that have been developed by CDC include plant personnel training, pilot flight training at airlines, bank teller training, and university classroom instruction.

Three areas in which the value of PLATO courseware has proven immeasurable involve training chronically unemployed and underemployed persons, persons with disabilities, and prison inmates awaiting release.

To help the unemployed and underemployed, a program using PLATO computer-based education called Fair Break was developed. At Pittsburgh's Control Data Institute, 70% of the 165 enrolled are unemployed steelworkers. PLATO is used to instruct these and other idled workers in computer technology.

Prison inmates are also benefitting from Fair Break. In a Stillwater, MN, correctional facility, the Fair Break program helps inmates accepted into the program learn basic reading and math skills, which in turn helps them in their vocational training. The men are much better prepared to find employment upon their release.

Homework, another PLATO program, was developed by Control Data for people who, because of illness or injury, have had to leave their jobs. Terminals in the home are hooked up over telephone lines to a main computer and other terminals in the network. Homework involves a six-month training program and teaches a wide variety of business applications.

The program began when Control Data realized their employees' frustration when, because of illness or an injury, they were able to function at home but unable to work at the office. In the fall of 1978, 12 CDC home-bound employees were equipped with terminals. the success of this program has attracted companies such as Goodwill Industries of Atlanta and others, who have contracted with the Control Data Homework program.

Employers using CDC's Homework benefit in two ways: they save thousands of dollars per year in disability costs, and simultaneously retain loyal, productive employees.

The next project on CDC's list is a third-party courseware program, whereby authors may submit quality programs for evaluation and possible acceptance into PLATO Courseware Development 2, or PCD2. To receive a submittal form, authors should write to the following:

Ken Modesitt, Manager
Computer Based Learning
Texas Instruments, Inc.
P.O. Box 10508
M/S 5890
Lubbock, Texas 79408

Whatever its applications, PLATO serves its role as "teacher" well. Infinitely patient, it serves the adult as well as the child. Each lesson truly builds on itself to provide the student with complete, well-rounded instruction at a pace that he can accomodate.

PLATO's system of one-to-one instruction is providing an open window to the past. A tradition thought lost has once again been revived. In this day of advanced computer technology, we've not forgotten that the best way to provide instruction is on a one-to-one basis. Texas Instruments and Control Data have provided that basis with PLATO. So aptly named for the illustrious student of Socrates, PLATO has finally come home.

(PLATO is a registered trademark of Control Data Corporation. U.S.A. Copyright© 1982 Control Data Corporation. All rights reserved.)

Another Parisian is missing, only this time it is Pierre Riche, son of the famous industrialist Roberto Riche, who has commissioned you . . . Inspector Hew Dunnit, to find his son for a substantial *REWARD*!!!

Follow Inspector Hew Dunnit in this adventure mystery through a spine-tingling trek around the world in his attempt to locate the Phantom of Blackmoore. If you are an adventure player, a game player, or just love a good mystery . . . THEN ENTER NOW!!!

FIRST PRIZE: Your choice of a TI Speech Synthesizer or a Signalman Mark III Telephone Modem.
TEN SECOND PRIZES: $75.00 in quality software from Instrumental Software Systems, Inc.

OFFICIAL RULES

1. For your copy of "The Phantom of Blackmoore" send a check or money order for the special contest price of $5.95 for cassette, (specify basic or x-basic) or $8.95 for Disc to: Instrumental Software Systems, Incorporated 311 Maple Street, Danvers, Massachusetts 01923 Enclose your name and address.

2. All entries must be postmarked not later than September 15, 1983. All programs will be mailed two to three weeks after the entry date to ensure a fair start for all.

3. Each solution must be mailed to us with the correct answer to the mystery and the individual code number that will be displayed by your computer when the mystery is solved.

4. Prizes will be awarded to those solutions that are received by us first. In case of a tie, the winners will be drawn at random.

5. In the case where your cassette or disc will not load or run, it may be returned in its original condition, within ten days of our mailing date for a full refund.

6. We cannot be responsible for lost, damaged, or illegible entries. All entrants agree to be bound by the official rules and Instrumental Software Systems Inc. shall have no liability other than stated therein.

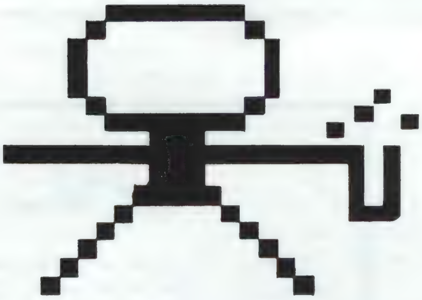
CACTI KILL

Cacti Kill is an original program coded by 13-year old Jim Pick, Burlington, Ontario, Canada. Jim has owned his 99/4A for little over a year and was elated recently when his parents presented him with a peripheral expansion box, disk system, and 32K RAM card so he could further develop his hobby.

An eighth grade student at Frontenac school in Burlington, Jim enjoys helping his fellow classmates learn BASIC and Extended BASIC programming after school. Although some of the high schools in his area offer computer courses, Jim's knowledge of programming is for the most part self-taught.

Jim is active in the Channel 99 local users-group located in Hamilton, Ontario and helps with maintaining the group's library. Very interested in working his way into assembly language programming, Jim plans to spend some of his summer vacation time honing his skills in this area. When not programming, Jim enjoys the challenge of Dungeons and Dragons.

```
100 !**********************
110 !*                    *
120 !*   "CACTI KILL"     *
130 !*DESIGNED AND WRITTEN*
140 !*         BY         *
150 !*      JIM PECK      *
160 !*                    *
170 !*   636 MULLIN WAY   *
180 !* BURLINGTON ONTARIO *
190 !*   CANADA L7L 4J4   *
200 !*                    *
210 !*   ENTHUSIAST '99   *
220 !*    VERSION 1.1     *
230 !*                    *
240 !**********************
250 CALL CLEAR
260 CALL SCREEN(15)
270 ON WARNING NEXT
280 NU=10
290 CALL MAGNIFY(4)
300 CALL CHAR(96,"010363F3F3F3FF7F070303030303030380C0C6CFCFCFFFFEE0C0C0C0C0C0
C")
310 CALL CHAR(100,"03040808080804030013F0102040810200C0201010121421C885FD85472010 0
804")
320 CALL CHAR(104,"1F3F303030303F3F3077BFDCDCDFC78F8FC0C0C0CFCFCFCE0DEBFB3B33
F1E")
330 CALL SPRITE(#1,96,13,1,32,-10,0,#2,100,2,86,32,-10,0,#3,104,7,151,32,-10,0)
340 DISPLAY AT(1,8)SIZE(23):"`b CACTTI CATCHER df"
350 DISPLAY AT(2,8)SIZE(23):"rc***************eg"
360 DISPLAY AT(5,8):" MAD DR. ZEZ IS LOOSE":TAB(7);"AGAIN!! THIS TIME HE'S":TAB(
7);"GIVEN SOME CACTI SOME"
370 DISPLAY AT(8,7):"OF HIS SECRET FORMULA":TAB(7);"AND THEY'RE ON THE":TAB(7);"
LOOSE!!":TAB(8);"YOUR JOB IS TO STOP"
380 DISPLAY AT(12,7):"THESE CACTI SO DR. ZEZ":TAB(7);"WILL GO AWAY.":TAB(8);"IF
YOU RUN INTO DR.":TAB(7);"ZEZ YOU WILL LOSE THE"
390 DISPLAY AT(16,7):"GAME.": :TAB(7);"IF YOU USE JOYSTICKS":TAB(7);"CHECK ALPHA
-LOCK"
400 DISPLAY AT(23,7):"PRESS ANY KEY TO":TAB(7);"CONTINUE."
410 CALL KEY(0,K,S):: IF S=0 THEN 410
420 DISPLAY AT(5,7):"DIFFICULTY LEVELS:": :TAB(7);"1  PRO          - 25": :TAB(7
);"2  INTERMEDIATE - 50": :TAB(7);"3  AMATEUR      - 75": :
430 DISPLAY AT(13,7):"4  BEGINNER'S   - 100"
440 FOR I=14 TO 23 :: DISPLAY AT(1,7):: NEXT I
450 DISPLAY AT(24,7):"LEVEL(1-4)? 3" :: ACCEPT AT(24,19)SIZE(-1)VALIDATE("1234")
:A :: TIME=A*25
460 CALL CLEAR :: CALL DELSPRITE(ALL)
470 DIM L(9)
480 FOR I=0 TO 9 :: L(I)=1 :: NEXT I
490 POINTS=0
500 FOR I=3 TO 12 :: RANDOMIZE :: CALL SPRITE(#I,96,4,INT(256*RND)+1,INT(256*RND
)+1,INT(20*RND)-10,INT(20*RND)-10):: NEXT I
510 CALL SPRITE(#1,104,7,INT(192*RND)+1,220)
520 CALL SPRITE(#2,100,2,INT(256*RND)+1,16,INT(20*RND)-10,INT(20*RND)-10)
```



BUY WORTEX
and get a one-year regular
membership extension in the
International 99/4 Users-Group

AMNION
STONEWARE
presents

WORTEX™

Uses single files — no need to keep formatted files
Uses TI Mailing List for mass mailings
All Epson features directly from keyboard
Multi-file chaining, multi-copy capable
Auto-formatting, built-in letterheads and auto-letter format
All editing features and auto wraparound of text
Assembly language speed
All updates FREE for 3 years from purchase date
Fully menu-driven with all on-screen "HELPS"
System price — $90.00

For details:

116 Carl St.
San Francisco, CA 94117
(415)753-5581

```
530 DISPLAY AT(24,1):"POINTS:";POINTS,"TIME:";TIME
540 IF TIME=0 THEN 770
550 FOR I=3 TO 12 :: CALL COINC(#1,#I,32,C)
560 IF C=-1 AND L(I-3)=1 THEN L(I-3)=0 :: CALL MOTION(#I,0,0):: CALL COLOR(#I,13
):: POINTS=POINTS+10 :: NU=NU-1 :: IF NU=0 THEN 730
570 CALL COINC(#2,#I,32,C)
580 IF C=-1 AND L(I-3)=0 THEN L(I-3)=1 :: RANDOMIZE :: CALL COLOR(#I,4):: CALL M
OTION(#I,INT(20*RND)-10,INT(20*RND)-10):: NU=NU+1
590 NEXT I
600 CALL KEY(1,K,S):: IF S=0 THEN 660
610 IF K=5 THEN N=0 :: M=4
620 IF K=3 THEN N=4 :: M=0
630 IF K=0 THEN N=0 :: M=-4
640 IF K=2 THEN N=-4 :: M=0
650 GOTO 670
660 CALL JOYST(1,N,M)
670 CALL MOTION(#1,-M*2,N*2)
680 IF RND<.3 THEN I=INT(10*RND)+3 :: IF L(I-3)=0 THEN 680 :: CALL MOTION(#I,INT
(20*RND)-10,INT(20*RND)-10)
690 IF RND<.05 THEN CALL MOTION(#2,INT(20*RND)-10,INT(20*RND)-10)
700 CALL COINC(#1,#2,32,C):: IF C=-1 THEN 790
710 TIME=TIME-1
720 GOTO 530
730 DISPLAY AT(10,1):"YOU WON!!!"
740 RESTORE 800
750 FOR I=1 TO 19 :: READ N :: CALL SOUND(100,N,1):: NEXT I
760 GOTO 780
770 DISPLAY AT(10,1):"YOU LOST!!"
780 DISPLAY AT(12,1):"PLAY AGAIN(Y/N)? Y" :: ACCEPT AT(12,18)SIZE(-1)VALIDATE("Y
Nyn"):AN$ :: IF AN$="Y" OR AN$="y" THEN CALL DELSPRITE(ALL):: RUN ELSE STOP
790 DISPLAY AT(10,1):"MAD DR. ZEZ GOT YOU!!" :: CALL SOUND(1000,-5,0):: CALL DEL
SPRITE(#1):: CALL SOUND(1,40000,30):: GOTO 780
800 DATA 262,330,392,523,392,523,330,392,523,659
810 DATA 523,659,392,523,659,784,659,784,784
820 END
```

COMPANION

By Terry Heim
Staff Technical Writer

Several months ago, the International Users-Group published in their newsletter a somewhat less than enthusiastic review of TI's best shot at a word processor, TI-Writer. Since that time, the market has been dominated by the attitude, "Well, it's not great, but it's the best there is."

For those of you who have been waiting so patiently for a choice in word processors, it's finally here.

COMPANION, a product of Intelpro, is an assembly language word processor for the 99/4A. Hardware requirements are:

1. Version 110 of TI Extended BASIC
2. Satisfactory use of 30 of the available 32 columns and all 24 available rows on the television or monitor
3. TI Disk Controller Card and one disk drive
4. The 32K Memory Expansion Card.

Although not required, a printer is recommended.

COMPANION comes with a very well-written manual and a disk containing the source programs and two sample texts. I have used both TI-Writer and COMPANION as well as other word processors, and was very impressed with the ease and efficiency of this program. In fact, I now use the COMPANION exclusively when writing letters and reviews.

DOCUMENTATION

The Documentation included with COMPANION consists of an 80-page manual which is extremely fluid and readable. This is always an unexpected pleasure, especially since the project coordinator for COMPANION is a professor of mathematical logic! The manual is almost entirely tutorial and therefore loses some ground as a reference tool, but this is offset by the simplicity of COMPANION.

The manual is divided into five main sections. They are: Editing and Printing, Saving and Loading Texts, Batch Processing, Parameter Revision, and the Appendices. The only section that may need explanation is the section on Batch Processing. A "batch" is a group of jobs to be run on a computer at the same time with the same program. COMPANION will allow an infinite number of files to be printed without interrupting the program. Each file may contain 18,000 characters.

PROGRAM FUNCTION

COMPANION consists of four programs, all of which load, initialize and start to work in the 23 seconds is takes for COMPANION to get its act together and present the main menu. The first program is a BASIC language program which displays the title screen and loads the other three programs. The second is a very compact accellerated assembly language loader. It loads a very large machine language (non-relocatable, compressed assembly language) program. (How large? the source code itself would occupy considerably more than one full diskette.) The fourth and last part of COMPANION is a BASIC program which directs the operation of COMPANION. The nice part of all of this is that once loaded, you can put the program diskette away and forget about it. This limits considerably the "disk swapping" associated with other word processors.

A 40-column screen, fully formed lower case letters with descenders and NO horizontal scrolling head COMPANION'S list of features. COMPANION was designed to be extremely flexible, easy to use and above all, untiring. Once you get past the main menu and begin creating text, you will be amazed at the speed and convenience offered by the editing functions. COMPANION makes very good use of all of the standard editing features and automatically reformats the screen up to 30 times per second. There are also 11 control characters which are used for paragraph indentation, line feed, centering text on a line, and several other useful operations. COMPANION can print up to 132 characters on a line and can make full use of all print modes on almost any printer.

At this time, COMPANION does not offer right margin justification. (Please don't get right justification confused with splitting words up between lines—COMPANION does prevent this.) There are also not provisions for "search and replace" or incorporating other programs into itself (such as names and addresses for a mailing list.) However, Intelpro says work is almost finished on the search and replace function and that all owners of COMPANION will receive this revision free of charge as soon as it becomes available, which will probably be within the next 90 days.

ERROR HANDLING

COMPANION'S error messages are clear and precise. It even tells you the program line number where something went wrong. The manual includes a summary of the most common errors and, as yet, I have not been able to catch COMPANION off guard.

CONCLUSIONS

COMPANION is the first (and only, as far as I know) word processor to step up to bat against TI-Writer on a equal basis. It has all of the speed of a well-written assembly language program, all of the features of a good word processor and all of the convenience that so many other word processors have left out. For those of you who would like more information or a product brochure, you can obtain one by writing

Intelpro
5825 Baillargeon St.
Brossard, Quebec
Canada J4Z 1T1

SPACE JOURNEY

By Dana Nichols
Managing Editor

What better way to teach children than by playing a learning game? Scott, Foresman and Company have combined the elements of mathematics and space-age animation in Space Journey, one in a series of Mathematics Action Games.

Space Journey was developed for use by students in grades five through eight. The program helps the student master mathematical skills while developing faculties for calculating fundamental number operations.

The game is made up of a variety of exercises involving decimals, fractions and percent. Its colorful graphics maintain student interest and involvement.

The object of this drill and practice game is to guide the spaceship to earth within two minutes by correctly answering a series of problems. The two-minute time limit is very important in this game; it motivates the student to think carefully before answering, because a wrong answer results in a loss of valuable time. If the child goes over the time limit, his ship is lost in space.

Students may play Space Journey at one of three levels: Amateur, Pro, or Champion. He can then elect to review the instructions by pressing AID, or proceed to start the game. Once the game has begun, the student can refer to the instructions at any time. Play then resumes at the point of interruption.

Additional function keys on the keyboard enable the student to return to previous screens, restart a game, and erase errors.

The object of Space Journey is as follows:

A single-player game, the student must guide his spaceship to earth within two minutes by correctly answering a series of problems. To reach earth, the student must intercept ten meteors or land on five planets. If a meteor hits the spaceship before it intercepts ten meteors or lands on five planets the ship will become lost in space. The game ends when the ship returns successfully to earth by intercepting the meteors or landing on the planets, or if it becomes lost in space.

After the difficulty level has been chosen and instructions read, the first problem will appear. An example of each level is as follows:

Amateur:	Give as a decimal.	63%
Pro:	Give as a decimal.	.7%
Champion:	Give as a percent.	1/2

Using as little time as possible, the student types in the correct answer and presses ENTER; he then gains control of the ship, whereby he chooses to either intercept the ten meteors or land on the five planets.

The player uses the arrow keys to move the spaceship. (The FCTN key is not required.) If he chooses to intercept the meteors, he moves the ship in line with a meteor, and presses M to fire a shot.

If the child chooses to land on the five planets, he guides his ship toward a planet using the arrow keys until the ship is directly on the face of planet, then presses ENTER.

At this point, the child will encounter hazardous situations on three of the five planets, and the student must answer one to four problems to escape the hazard.

For example: "You have landed in an asteroid shower. You can escape only if you answer four problems correctly. Press ENTER to go on."

The challenge of "beating the clock" provides entertainment and motivation for the student. By winning, the child displays ability to calculate quickly and accurately.

Space Journey is a colorful game with excellent graphics. The game is involving and motivating: students receive immediate reinforcement when a question is answered correctly, and is encouraged to try again if an error is made. The time limit encourages the student to think carefully about his answer, and offers the challenge to beat the clock. Scott, Foresman and Company's Space Journey is an excellent mathematics drill and practice game for children in grades five to eight, and will soon be available through the IUG.

BOOK REVIEW

SMART PROGRAMMING GUIDE FOR SPRITES

By Robert Mele

I am tired of going to the book stores and not finding much of anything for the 99/4A. That situation seems to be changing, for within the last four weeks I have noticed at least three books for the 4A. All of those books dealt with programming in standard BASIC, and they could be helpful, but for those of us with Extended BASIC nothing seemed to be printed.

Craig Miller has come to the rescue with a new book called Smart Programming Guide for Sprites. This 76-page book is a masterpiece of intelligent, understandable writing. This is not a book dealing with all of the Extended BASIC language. What it does give you is a professional programmer's secrets and programming ability dealing with sprites.

The first thing that struck me about the book was the clarity of the programs. They seemed to be about 3 times the normal letter size which made typing them in extremely easy with little chance for error. The second thing I liked was the inclusion of note pages. These pages came in very handy for listing my own ideas as I read and studied the text.

The book is divided into sections rather than chapters, with each section dealing with a specific aspect of sprites. The first three sections give tips on general programming, converting from graphic row and columns to dot row and columns and back, and the use of call character.

The next two sections of the book give six programs dealing with joystick and keyboard routines. The first joystick and keyboard routine sets sprites in motion only when the joystick is moved or a key is pressed. The second programs demonstrate additive motion, and the third programs move a sprite to a new graphic row and/or column each time the joystick is moved or when a key is pressed.

The next section of the book was a real eye opener. Mr. Miller has discovered some addresses that can be Peeked to obtain useful values for the programs that you write. There is an address that generates random integers from 0-99 and a double random number generator. The double random number generator has to be seen to be believed. Mr. Miller has a program that randomly places an asterisk on the screen using Extended BASIC and then the next line does the same thing only using the Peek address and the difference in speed is incredible.

In the next section Mr. Miller gives three short programs that generate different sprite patterns that float across the screen. When I say short I mean short. These programs are each only two lines long.

The next section demonstrates even more the power of the Extended BASIC language. There are two program in this section. The first randomly moves a sprite around the screen and sets the second sprite in motion towards the first

ASSEMBLY LANGUAGE TEXT PROCESSING

Companion

A truly flexible, lightning fast, writer-oriented word processor which treats your text conceptually. COMPANION accepts your text as a sequence of phrases and commands, and intelligently reformats the text for printout. Simple text-imbedded commands continuously dictate the desired format and printer mode. ALL text manipulation is in ASSEMBLY LANGUAGE. COMPANION's features include:

▪ MENU driven ▪ 40 column FULL-SCREEN editor ▪ FULLY FORMED lower case letters with descenders ▪ AUTO REPEAT accelerates to 30 reps/second ▪ COMPLETE screen reformatting and reprint BETWEEN KEYSTROKES ▪ SMOOTH vertical scroll, up or down ▪ EIGHT cursor motion keys ▪ 18000 character memory CAPACITY ▪ Text-imbedded commands provide CONTINUOUS control of ALL FOUR margins, indentations, spacing, form width ▪ COMPLETE control of printer mode ▪ Prints ANY character, ASCII codes 0-255 ▪ Automatic CENTERING ▪ UltraFAST loading ▪ FULL ERROR RECOVERY ▪ EIGHT completely independent tab sets ▪ 80 page manual ▪ Unlimited BATCH PROCESSING permits multiple disk tasks ▪ Prints on virtually ANY modern tractor feed printer ▪ Page numbering: automatic or suppressed ▪ Ph.D. designed, written, and documented ▪ WRITE for free brochure ▪ Requires 99/4A, Extended Basic (new version, Version 110), RS232 or PIO, Disk Drive & Controller, Memory Expansion

Diskette $64.95 Intelpro (514)-656-8798

5825 Baillargeon St., Brossard, Quebec, Canada J4Z 1T1

sprite. The second program allows you to move the first sprite with the joystick and have the second sprite chase after you. Oh, I forgot to mention that each of these programs is only three lines long. You are going to be surprised at the strength of your Extended BASIC.

This covers only the first half of the book. The second half includes programs on shooting while never missing a coincidence, making a sprite pick up and put down an object, making a sprite eat dots or lay down a trail, and building a maze while you control a moving sprite through it. Incredibly, none of these programs is more than eight lines long.

The last section of the book sets up general bar graph. Even this program is only 18 lines long. The graph program defines its own characters, sets the colors, displays the scale multiplier as well as the value between dots on the scale, and it will generate a bar graph for one to 20 items.

This is the best book I have seen for programming sprites. It is easy to follow and type the programs, but I have saved the best for last. This book costs only $5.95 plus $1.50 shipping. It is available by mail order from Millers Graphics, 1475 W. Cypress Ave, San Dimas, CA 91773.

CC-40 ADDRESS BOOK

```
100 ON ERROR 330
110 PRINT "ENTER FIRST LETTER"
120 NAME1$,NAMET$=KEY$:IF NAME1$<"A" OR NAME1$>"Z" THEN 280
130 INDEX=(ASC(NAME1$)-64)*1000/256
140 INDEX1=INT(INDEX):INDEX2=(INDEX-INDEX1)*256
150 CALL POKE(8051,INDEX1,INDEX2)
160 RESTORE 1000
170 POSITION=1
180 READ NAME$,STREET$,CITY$
190 IF NAME1$<>SEG$(NAME$,1,1) THEN 280
200 IF NAMET$<>SEG$(NAME$,1,POSITION) THEN 180
210 PRINT NAME$
220 I$=KEY$:IF I$=CHR$(13) THEN 250
230 NAMET$=NAMET$&&I$:PRINT NAMET$
240 POSITION=POSITION+1:GOTO 180
250 IF STREET$="^" THEN GOTO 290
260 PRINT STREET$:D$=KEY$
270 PRINT CITY$:D$=KEY$:GOTO 110
280 PRINT "NAME NOT FOUND":PAUSE 1:GOTO 110
290 INDEX=VAL(CITY$)/256:INDEX1=INT(INDEX):INDEX2=(INDEX-INDEX1)*256
300 CALL POKE(7798,INDEX1,INDEX2)
310 RESTORE 1000
320 READ NAME$,STREET$,CITY$:PRINT NAME$:D$=KEY$:GOTO 260
330 PRINT "NO NAMES BEGINNING WITH ";NAME1$:PAUSE 1:GOTO 100
1000 REM A DATA
1010 DATA ARLEEN MAUZY 602-555-1212,123 HUSTON ST,MESA AZ 85030
2000 DATA BILL GRONOS 733-9736,9505 1/2 SE 15 #B,MIDWEST CITY OK 73130
3000 REM C DATA
3010 DATA "CARTER,JACK",^,10010
3020 DATA CHRIS CROSS 666-7734,101 MAIN ST,HELL MI
3030 DATA CHARLIE LAFARA 948-1023,P.O. BOX 67,BETHANY OK 73008
7000 DATA "GRONOS,BILL",^,2000
10000 REM J DATA
10010 DATA JACK CARTER 947-1234,4820 SE 26TH ST,OKC OK
13000 REM M DATA
13010 DATA "MAUZY, ARLEEN",^,1010
16000 DATA PERCOM DATA 800-527-1222,11220 PAGEMILL RD,DALLAS TX 75243
19000 DATA "SCOTT,FORESMAN AND CO. 312-729-3000",1900 E LAKE AVE
19020 DATA GLENVIEW IL 60025
20000 DATA TEXAS INSTRUMENTS TOLL FREE NUMBER 800-858-4565,BOX 53
20010 DATA LUBBOCK TX 79408
20020 DATA TI TECHNICAL LINE  806-741-2663,PO BOX 53,LUBBOOCK TX 79408
30000 DATA #,#,#
```

FREE DISKS OFFER*
FIND PROGRAMS FAST WITH SUPER CATALOGER™

"If you have a disk system, printer, Memory Expansion and Extended BASIC, **you ... won't want to be without this *SUPER CATALOGER*™."**
— ***99'er Magazine*** *(3 83 p.21)*

"**It is very fast!** My printer started up so quickly that I initially jumped at it's sound. ... It really is a ***SUPER CATALOGER*™."** — ***Rev. Keith G. Koch***

⇨ ⇨ ⇨ **ORDER NOW** ⇦ ⇦ ⇦

Send check or money order for $29.95
Call (703) 820-4131 for C.O.D. shipment $32.95

**To get 2 addt'l disks, send copy of this ad with order. Offer ends 8 31 83. Not valid with any other offer.*

J & K H Software (Dept. B)
2820 S. Abingdon St., Arlington, VA 22206

***SUPER CATALOGER*™**
The ORIGINAL TI-99/4(A) Multi-Disk Catalog Program
created by Larry Hughes with graphics and
assembly language enhancements by Jim Hollender

NO RISK — 15 DAY MONEY BACK GUARANTEE

TAX ESTIMATOR

Tax Estimator was designed to aid the taxpayer in estimating his tax situation each year. Programmed on a bi-weekly format, one can use Tax Estimator year-round to project predicted financial changes and their effects. The program is easy to use and virtually crash-proof.

At any given point during the year, Tax Estimator can provide an up-to-date report based on any changes made. For example, if one knew of a major tax deductible purchase to be made within the year, it could be entered into the program, and one could see what effect that purchase would have throughout the year.

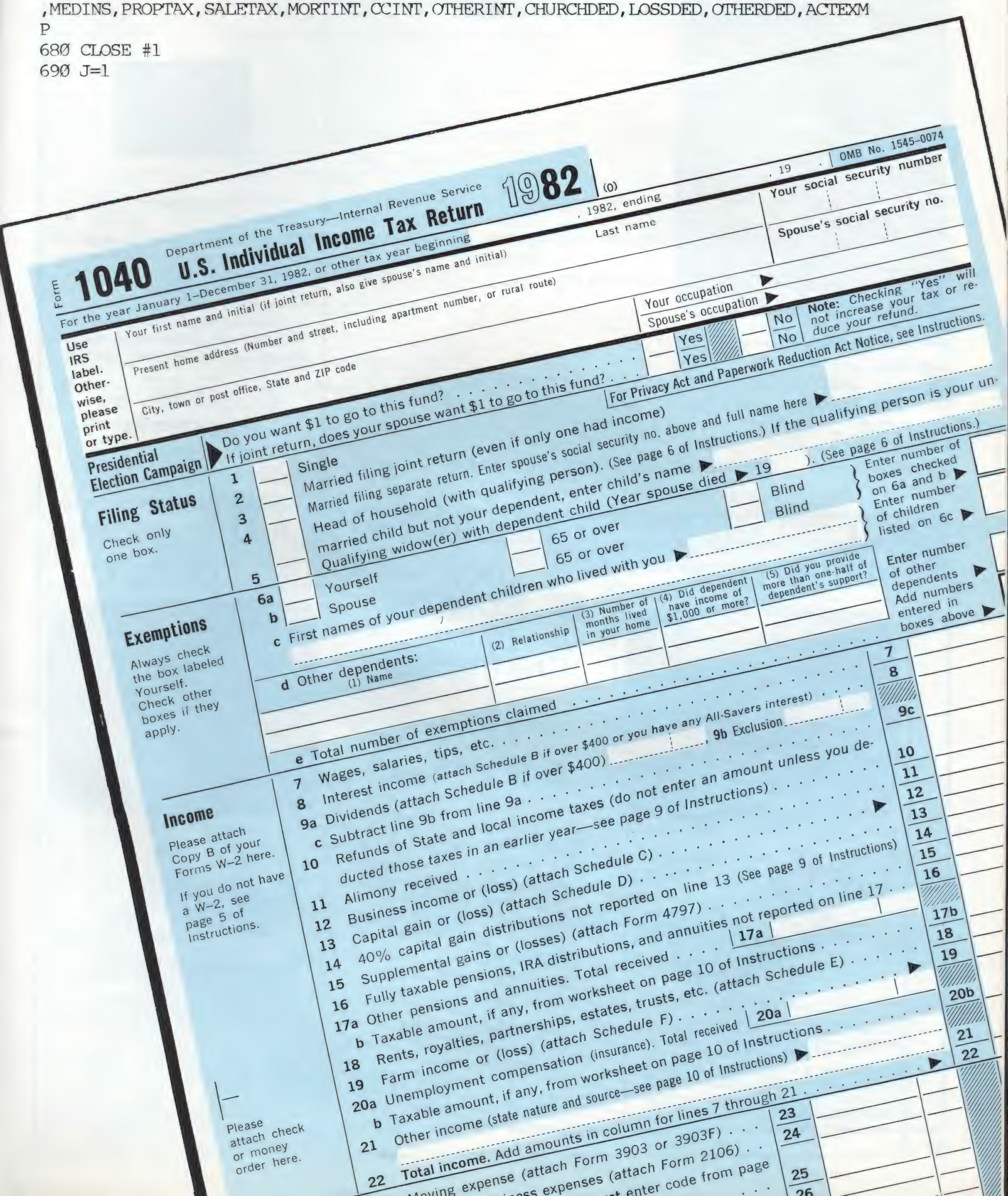
The program can also figure taxes based on a list of itemized deductions, as opposed to the standard 1040 form. Tax Estimator can figure any tax to be paid or refunded.

In addition, the program can accommodate hypothetical statements. One can enter up-to-date income figures into the program's memory, then pose "what if?" problems.

Tax Estimator is also capable of changing a block of categories at once according to program specifications. For example, if one expects a certain income figure for each pay period, he can specify them and instruct the program to enter that amount to those periods at once, thereby eliminating the tedious task of entering like data on each line.

Tax Estimator is an extremely versatile program that can be used year-round and keep the taxpayer aware of his tax situation well ahead of time.

```
100 REM ********************
110 REM *                  *
120 REM *  TAX ESTIMATOR   *
130 REM *  ENTHUSIAST '99  *
140 REM *   VERSION 2.2    *
150 REM *                  *
160 REM ********************
170 REM
180 OPTION BASE 1
190 DIM INCOME(24)
200 DIM ALLOWANCES(24)
210 DIM TAXINC(24)
220 DIM WITH(24)
230 CALL CLEAR
240 PRINT "     TAX ESTIMATOR"
250 PRINT "     =============": : :
260 PRINT "PRESS  TO": :
270 PRINT "  1    SET UP FOR FIRST TIME": :
280 PRINT "  2    LOAD DATA FROM TAPE"
290 PRINT : : : : : : : : : : : :
300 GOSUB 3830
310 IF S=0 THEN 300
320 IF KY=50 THEN 580
330 IF KY<>49 THEN 300
340 FOR I=1 TO 24
350 CALL CLEAR
360 PRINT "FOR PAY PERIOD ";I
370 PRINT "ENTER:INCOME,ALLOWANCES"
380 INPUT INCOME(I),ALLOWANCES(I)
390 NEXT I
400 CALL CLEAR
410 INPUT "ENTER:OTH INC OR ADJUSTMENTS?":OTHERINC
420 INPUT "ENTER:OTHER WITHHOLDINGS    ?":OTHERWITH
430 CALL CLEAR
440 INPUT "ENTER:STATE TAX,STATE RETURN?":SIT,SITRETURN
450 CALL CLEAR
460 INPUT "ENTER:INTEREST INC.,DIVIDEND?":INTINCOME,DIVIDEND
470 CALL CLEAR
480 INPUT "ENTER:DRUGS,MEDICAL,MED INS.?":MEDICINE,MEDPAY,MEDINS
490 CALL CLEAR
500 INPUT "ENTER:PROPERTY TAX,SALES TAX?":PROPTAX,SALETAX
510 CALL CLEAR
520 INPUT "ENTER:MORT.INT.,CREDIT CARD,OTHER INT.?":MORTINT,CCINT,OTHERINT
530 CALL CLEAR
540 INPUT "ENTER:CHURCH,LOSS,OTHER DED.?":CHURCHDED,LOSSDED,OTHERDED
550 CALL CLEAR
560 INPUT "ENTER:ACTUAL EXEMPTIONS?   ":ACTEXMP
570 GOTO 690
580 CALL CLEAR
590 PRINT "LOADING EXISTING DATA.": :
600 OPEN #1:"CS1",INTERNAL,INPUT ,FIXED 192
610 FOR J=0 TO 2
620 FOR I=8*J+1 TO 8*(J+1)
630 INPUT #1:INCOME(I),ALLOWANCES(I),
640 NEXT I
650 INPUT #1:Z
660 NEXT J
670 INPUT #1:OTHERINC,OTHERWITH,SIT,SITRETURN,INTINCOME,DIVIDEND,MEDICINE,MEDPAY
,MEDINS,PROPTAX,SALETAX,MORTINT,CCINT,OTHERINT,CHURCHDED,LOSSDED,OTHERDED,ACTEXM
P
680 CLOSE #1
690 J=1
```



Form **1040** Department of the Treasury—Internal Revenue Service
U.S. Individual Income Tax Return **1982** (0)
For the year January 1–December 31, 1982, or other tax year beginning , 1982, ending , 19 . OMB No. 1545-0074

Use IRS label. Otherwise, please print or type.
Your first name and initial (if joint return, also give spouse's name and initial) Last name
Your social security number
Present home address (Number and street, including apartment number, or rural route)
Spouse's social security no.
City, town or post office, State and ZIP code
Your occupation ▶
Spouse's occupation ▶

Presidential Election Campaign ▶ Do you want $1 to go to this fund? Yes No
If joint return, does your spouse want $1 to go to this fund? Yes No
Note: Checking "Yes" will not increase your tax or reduce your refund.
For Privacy Act and Paperwork Reduction Act Notice, see Instructions.

Filing Status
Check only one box.
1 Single
2 Married filing joint return (even if only one had income)
3 Married filing separate return. Enter spouse's social security no. above and full name here ▶
4 Head of household (with qualifying person). (See page 6 of Instructions.) If the qualifying person is your unmarried child but not your dependent, enter child's name ▶
5 Qualifying widow(er) with dependent child (Year spouse died ▶ 19). (See page 6 of Instructions.)

Exemptions
Always check the box labeled Yourself. Check other boxes if they apply.
6a Yourself 65 or over Blind
b Spouse 65 or over Blind
Enter number of boxes checked on 6a and b ▶
c First names of your dependent children who lived with you ▶
Enter number of children listed on 6c ▶
d Other dependents: (1) Name (2) Relationship (3) Number of months lived in your home (4) Did dependent have income of $1,000 or more? (5) Did you provide more than one-half of dependent's support?
Enter number of other dependents ▶
e Total number of exemptions claimed
Add numbers entered in boxes above ▶

Income
Please attach Copy B of your Forms W-2 here.
If you do not have a W-2, see page 5 of Instructions.
7 Wages, salaries, tips, etc. 7
8 Interest income (attach Schedule B if over $400 or you have any All-Savers interest) 8
9a Dividends (attach Schedule B if over $400) , 9b Exclusion
c Subtract line 9b from line 9a 9c
10 Refunds of State and local income taxes (do not enter an amount unless you deducted those taxes in an earlier year—see page 9 of Instructions) 10
11 Alimony received 11
12 Business income or (loss) (attach Schedule C) 12
13 Capital gain or (loss) (attach Schedule D) 13
14 40% capital gain distributions not reported on line 13 (See page 9 of Instructions) 14
15 Supplemental gains or (losses) (attach Form 4797) 15
16 Fully taxable pensions, IRA distributions, and annuities not reported on line 17 16
17a Other pensions and annuities. Total received 17a
b Taxable amount, if any, from worksheet on page 10 of Instructions 17b
18 Rents, royalties, partnerships, estates, trusts, etc. (attach Schedule E) 18
19 Farm income or (loss) (attach Schedule F) 19
20a Unemployment compensation (insurance). Total received 20a
b Taxable amount, if any, from worksheet on page 10 of Instructions ▶ 20b
21 Other income (state nature and source—see page 10 of Instructions) 21
22 **Total income.** Add amounts in column for lines 7 through 21 ▶ 22

Please attach check or money order here.
Moving expense (attach Form 3903 or 3903F) 23
ness expenses (attach Form 2106) 24
enter code from page 25
26

```
700 CALL CLEAR
710 PRINT "PERIOD INCOME ALLOWANCES"
720 PRINT "====== ====== ==========": :
730 FOR I=J TO J+11
740 PRINT I;TAB(8);INCOME(I);TAB(15);ALLOWANCES(I)
750 NEXT I
760 IF J=13 THEN 800
770 GOSUB 3820
780 J=13
790 GOTO 700
800 PRINT :"ANY CHANGES(Y OR N)?"
810 GOSUB 3830
820 IF KY=78 THEN 930
830 IF KY<>89 THEN 810
840 CALL CLEAR
850 INPUT "ENTER:FROM PERIOD,TO PERIOD ?":J,K
860 CALL CLEAR
870 INPUT "ENTER:NEW INCOME,ALLOWANCES ?":L,M
880 FOR I=J TO K
890 INCOME(I)=L
900 ALLOWANCES(I)=M
910 NEXT I
920 GOTO 690
930 CALL CLEAR
940 PRINT "ITEM#"
950 PRINT "-----"
960 PRINT "  1   OTH INC OR ADJ";TAB(23);OTHERINC
```

!!ASSEMBLY LANGUAGE!!

****** ENIGMA ******

You are hovering amidst a group of menacing asteroids: you must either use your deflector shields or blast the rocks into smaller and smaller chunks ....what will you do?

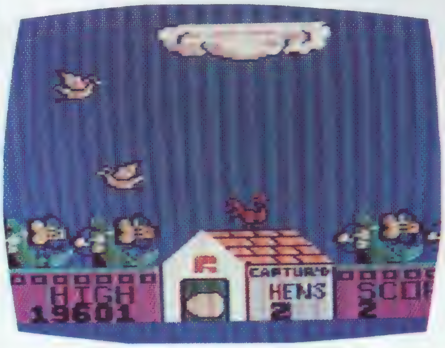
4-K Assembly language program for the TI 99-4(A) with the Mini-Memory Module. Shipped on cassette with instruction manual.

$20.00

PARRYSOFT

RT. 1, Box 14-B
Cordele, Georgia 31015

HEN PECKED™



LOOK !

™ ROMOX ™

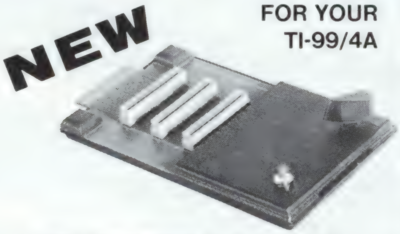
GAME CARTRIDGES

These new ROMOX cartridges offer the best arcade quality games ever put on the TI-99/4A. Just look at the screens, what more can we say?
Both are now available from NAVARONE INDUSTRIES.

$37⁵⁰ ea.

TOPPER™

FOR YOUR TI-99/4A



WIDGIT—Cartridge Expander Board

A new "**WIDGIT**" cartridge expander board that lets you plug up to three TI-99/4A command modules. The "**WIDGIT**" comes complete with 3 sockets, a rotary switch and a button to reset the computer without turning power off and on.

The "**WIDGIT**" plugs directly into the "game slot" on the TI-99/4A console. It has a protective covering with rubber feet that will not scratch your console. Simply insert the "**WIDGIT**" into the game port, plug up to 3 command modules. Select your favorite cartridge with the rotary switch then press the reset button to re-start the computer.
Catalog number: WD-01

PRICE: $49.40 ea.

• SPRITE EDITOR *	$29.95
• MUSIC EDITOR *	$29.95
• ASTROLOGY HOROSCOPE MAKE *	$49.95
• DISK FIXER **	$29.95

* EXTENDED BASIC required
** EDITOR/ASSEMBLER required

This software requires 32K memory plus disk. Supplied on disk only.

MAIL TO
NAVARONE INDUSTRIES
510 Lawrence Expressway #800
Sunnyvale, California 94086

ORDERING INFORMATION

Please indicate the items you wish to order, the quantity, and the price of each item

Send with a Cashier's check or M.O (personal checks take an aditional 10 days to clear) NO credit cards C.O.D.'s (add $5.00) Please allow 4 to 6 weeks for delivery

Add 5% of total order for shipping and handling. Cal residents add 6% sales tax.

ECPC ™
CARTRIDGE PROGRAMMER

Put your **own** programs on **ROMOX ECPC** cartridges with this unique new CARTRIDGE PROGRAMMER that plugs into the "game port" on your **TI-99/4A** computer.

This unit comes complete with software to transfer your programs from Disk to **ROMOX ECPC** blank cartridges. Instructions are provided that explain how to write programs that operate from the ECPC cartridge.

WD-03	Cartridge Programmer	$300.00 ea.
WD-04	Cartridge Eraser (EPROM Eraser)	$39.95 ea.
TI-01	Blank 8K ECPC Cartridges	$19.95 ea.

Romox and ECPC are registered trade marks of ROMOX Incorporated.

Software does not provide for cartridge duplication.

```
970 PRINT "  2   OTH WITHHOLDINGS";TAB(23);OTHERWITH
980 PRINT "  3   STATE TAX";TAB(23);SIT
990 PRINT "  4   STATE TAX RTN.";TAB(23);SITRETURN
1000 PRINT "  5   INTEREST INCOME";TAB(23);INTINCOME
1010 PRINT "  6   DIVIDENDS";TAB(23);DIVIDEND
1020 PRINT "  7   DRUGS & MEDICINE";TAB(23);MEDICINE
1030 PRINT "  8   MEDICAL PAYMENTS";TAB(23);MEDPAY
1040 PRINT "  9   MED. INSURANCE";TAB(23);MEDINS
1050 PRINT " 10   PROPERTY TAX";TAB(23);PROPTAX
1060 PRINT " 11   SALES TAX";TAB(23);SALETAX
1070 PRINT " 12   MORT. INTEREST";TAB(23);MORTINT
1080 PRINT " 13   CREDIT CARD INT.";TAB(23);CCINT
1090 PRINT " 14   OTHER INTEREST";TAB(23);OTHERINT
1100 PRINT " 15   CHURCH CONTRIB.";TAB(23);CHURCHDED
1110 PRINT " 16   CASUALTY & LOSS";TAB(23);LOSSDED
1120 PRINT " 17   OTHER DEDUCTIONS";TAB(23);OTHERDED
1130 PRINT " 18   ACTUAL EXMPTNS";TAB(23);ACTEXMP: :
1140 PRINT "ANY CHANGES(Y OR N)?"
1150 GOSUB 3830
1160 IF KY=78 THEN 1560
1170 IF KY<>89 THEN 1150
1180 INPUT "ENTER:ITEM#,NEW VALUE?":I,J
1190 ON I GOTO 1200,1220,1240,1260,1280,1300,1320,1340,1360,1380,1400,1420,1440,
1460,1480,1500,1520,1540
1200 OTHERINC=J
1210 GOTO 930
1220 OTHERWITH=J
1230 GOTO 930
1240 SIT=J
1250 GOTO 930
1260 SITRETURN=J
1270 GOTO 930
1280 INTINCOME=J
1290 GOTO 930
1300 DIVIDEND=J
1310 GOTO 930
1320 MEDICINE=J
1330 GOTO 930
1340 MEDPAY=J
1350 GOTO 930
1360 MEDINS=J
1370 GOTO 930
1380 PROPTAX=J
1390 GOTO 930
1400 SALETAX=J
1410 GOTO 930
1420 MORTINT=J
1430 GOTO 930
1440 CCINT=J
1450 GOTO 930
1460 OTHERINT=J
1470 GOTO 930
1480 CHURCHDED=J
1490 GOTO 930
1500 LOSSDED=J
1510 GOTO 930
1520 OTHERDED=J
1530 GOTO 930
1540 ACTEXMP=J
```

EXTENDED
automatic
tone dialer &
directory program*

only
$19.95 POSTPAID

ALPHA 2
COMPUTER SERVICES
DEPT I
4859 SO. SPENCER ST
SEATTLE WA 98118

SATISFACTION GUARANTEED!

*requires extended basic

Cassette or disk
"Works like a champ,"
Terry Heim, IUG.

IT'S NO GAME!!

Not another computer game but an actual speed handicapping aid for thoroughbred racing, handling up to sixteen horses per race from 4½ furlongs to 2 miles.

IT'S FAST!

Just six bits of information from *The Daily Racing Form*© and your TI-99/4 (4A) returns speed of each horse in ft./sec. at each quarter, plus predicted finish time! Manages horse numbers, OTB letters and scratches; adjusts routers and sprinters.

User Friendly!

Package contains cassette and step-by-step instruction booklet. Data displays on screen and/or TI thermal printer (recommended) or compatable RS232.

ONLY $34.95!

NY State residents add sales tax
Canadian residents: $42.95
Send check or money order to:

TRACKSMITH
P.O. Box 738, Cooper Station, NY 10276

WIZARD'S DOMINION
99/4 **A Fantasy Adventure** 99/4A

The Voritka Ogres are on the prowl. Only the Wizard's Apprentice, the Evil Wizard, the Hero and the Evil Prince have enough courage to defeat them and rule Wavoria. Inside the caverns of The Wizard's Dominion lay gold, adventure and magical powers.

- 3-D Perspective
- Superb Graphics
- Ages 12 to Adult
- Magical Powers Galore
- Complex Battles
- Many levels to Conquer

IMPROVED - VERSION 2.0 NOW AVAILABLE

Extended Basic Language

All this for only!! $19.95 cassette $21.95 disk

Spelling Teacher

Spelling teacher is designed for students to enter their weekly spelling list from school. After you enter the words you want to study, the spelling teacher will flash the words back for you to spell. Flashing the word back for a fraction of a second actually reinforces correct spelling. The computer remembers the misspelled words and goes over them with you to help you learn them. A speech option is included for those with the speech synthesizer and terminal emulator II. Basic Language $19.95 Cassette, $21.95 Disk.

Many other programs in Basic & Extended Basic available. Write for more information.

Complete instruction included. To save C.O.D. charges, send check or money order plus $1.50 shipping/handling. MN residents add 6% sales tax.

ASD&D

AMERICAN SOFTWARE
DESIGN & DISTRIBUTION CO.
P.O. BOX 46 A
COTTAGE GROVE, MN 55016-0046

```
1550 GOTO 930
1560 CALL CLEAR
1570 WAGES=0
1580 TOTALWITH=0
1590 FOR I=1 TO 24
1600 WAGES=WAGES+INCOME(I)
1610 TAXINC(I)=INCOME(I)-ALLOWANCES(I)*1000/24
1620 IF TAXINC(I)>100 THEN 1650
1630 WITH(I)=0
1640 GOTO 1840
1650 IF TAXINC(I)>253 THEN 1680
1660 WITH(I)=(TAXINC(I)-100)*.12
1670 GOTO 1840
1680 IF TAXINC(I)>499 THEN 1710
1690 WITH(I)=18.36+(TAXINC(I)-253)*.16
1700 GOTO 1840
1710 IF TAXINC(I)>772 THEN 1740
1720 WITH(I)=57.72+(TAXINC(I)-499)*.19
1730 GOTO 1840
1740 IF TAXINC(I)>983 THEN 1770
1750 WITH(I)=109.59+(TAXINC(I)-772)*.24
1760 GOTO 1840
1770 IF TAXINC(I)>1204 THEN 1800
1780 WITH(I)=160.23+(TAXINC(I)-983)*.27
1790 GOTO 1840
1800 IF TAXINC(I)>1425 THEN 1830
1810 WITH(I)=219.9+(TAXINC(I)-1204)*.32
1820 GOTO 1840
1830 WITH(I)=290.62+(TAXINC(I)-1425)*.37
1840 TOTALWITH=TOTALWITH+WITH(I)
1850 NEXT I
1860 TOTALWITH=TOTALWITH+OTHERWITH
1870 IF DIVIDEND>400 THEN 1900
1880 EXCLUSION=DIVIDEND
1890 GOTO 1910
1900 EXCLUSION=400
1910 TAXABLEDIV=DIVIDEND-EXCLUSION
1920 GROSSINCOME=WAGES+INTINCOME+TAXABLEDIV+OTHERINC+SITRETURN
1930 MEDICINEXCL=GROSSINCOME*.01
1940 IF MEDICINE<MEDICINEXCL THEN 1970
1950 MEDICINEDED=MEDICINE-MEDICINEXCL
1960 GOTO 1980
1970 MEDICINEDED=0
1980 TOTALMEDICAL=MEDICINEDED+MEDINS+MEDPAY
1990 MEDEXCL=GROSSINCOME*.05
2000 IF TOTALMEDICAL>MEDEXCL THEN 2030
2010 TOTALMED=0
2020 GOTO 2040
2030 TOTALMED=TOTALMEDICAL-MEDEXCL
2040 TOTALMEDDED=TOTALMED
2050 TOTALTAXDED=SIT+PROPTAX+SALETAX
2060 TOTALINTDED=MORTINT+CCINT+OTHERINT
2070 TOTALCONTRIB=CHURCHDED
2080 TOTALOTHERDED=LOSSDED+OTHERDED
2090 SUMMARYDED=TOTALMEDDED+TOTALTAXDED+TOTALINTDED+TOTALCONTRIB+TOTALOTHERDED
2100 STANDARDDED=3400
2110 TOTALDED=SUMMARYDED-STANDARDDED
2120 IF TOTALDED>0 THEN 2140
```

MIRAGE SOFTWARE PRESENTS

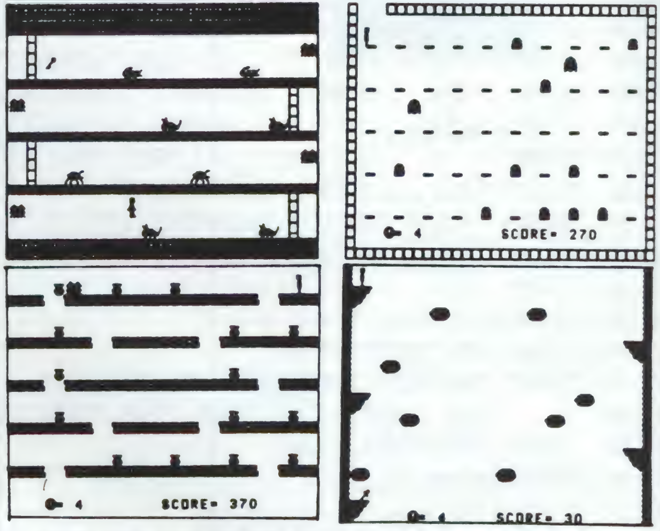
TREASURE HUNT

©1983 JOHN C. WILLIAMS
JOHN D. GARDNER

A 4 SCREEN!!
Graphic Adventure

CASSETTE $17.95 DISK

EXTENDED BASIC REQUIRED



PLEASE SEND CHECK OR MONEY ORDER PAYABLE IN U.S. CURRENCY TO:

MIRAGE SOFTWARE
P.O. BOX 613
WEST SENECA N.Y. 14224

MIRAGE SHIPS PPD. IN THE CONTINENTAL U.S./ ALASKA, HAWAII
MEXICO ADD $1.50 ALL OTHER COUNTRIES ADD $3.50. SORRY NO C.O.D
N.Y. RESIDENTS ADD 7% TAX AREA CODE(716) 674-5511

MUSIC SOFTWARE
DIRECTORY/UPDATE

PROGRAMS FOR THE
TI-99/4(A) COMPUTER

For the Directory and 2 updates
send $12 check or money order to:

LOLITA WALKER GILKES
2701-C West 15th Street, Suite 277
Plano, Texas 75075

(TX residents add 5% sales tax)

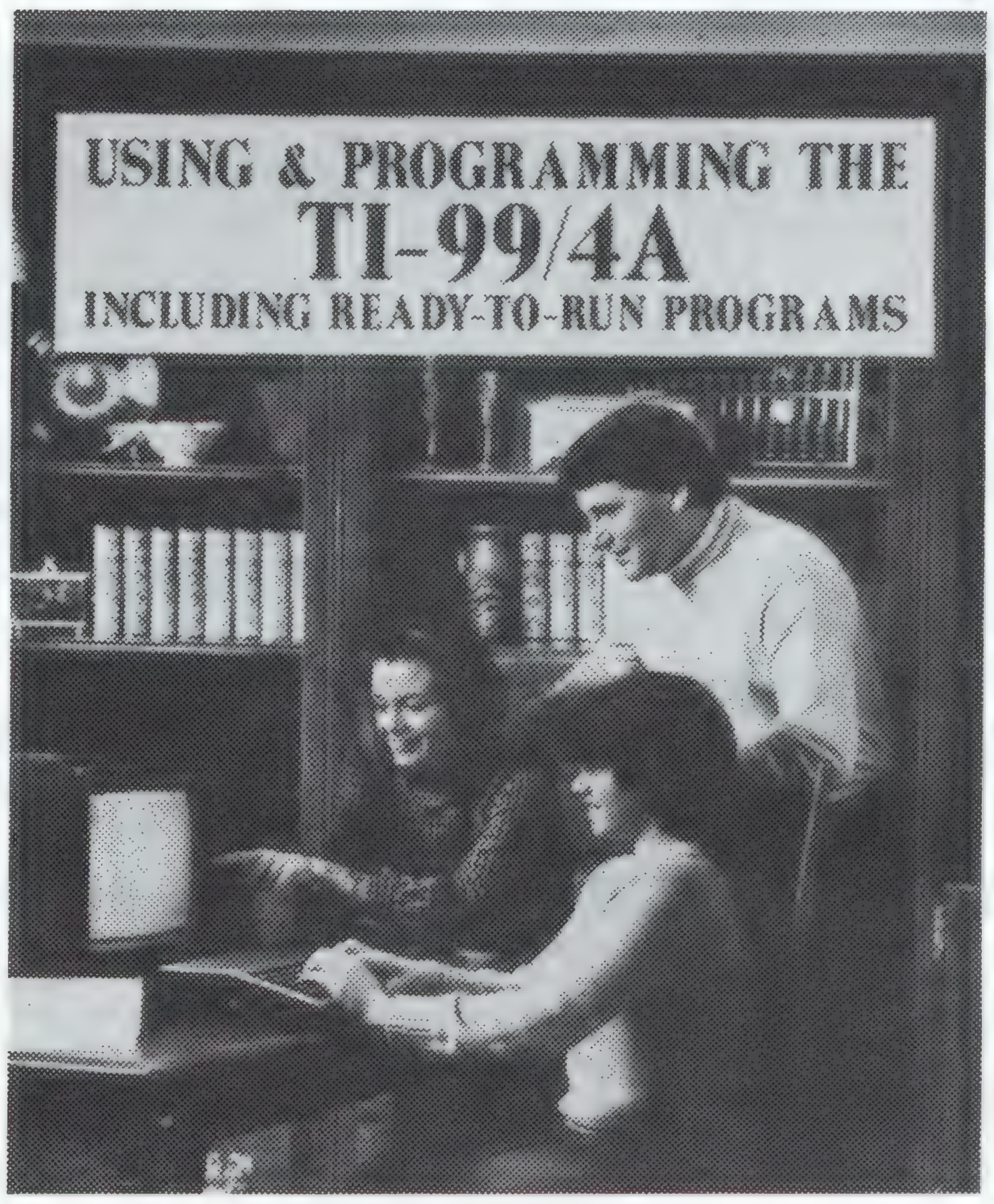
```
2130 TOTALDED=0
2140 NETINCOME=GROSSINCOME-TOTALDED
2150 IF NETINCOME>0 THEN 2170
2160 NETINCOME=0
2170 EXEMPTIONS=ACTEXMP*1000
2180 TAXINCOME=NETINCOME-EXEMPTIONS
2190 IF TAXINCOME>0 THEN 2210
2200 TAXINCOME=0
2210 IF TAXINCOME>3400 THEN 2240
2220 FIT=0
2230 GOTO 2580
2240 IF TAXINCOME>5500 THEN 2270
2250 FIT=(TAXINCOME-3400)*.12
2260 GOTO 2580
2270 IF TAXINCOME>7600 THEN 2300
2280 FIT=252+(TAXINCOME-5500)*.14
2290 GOTO 2580
2300 IF TAXINCOME>11900 THEN 2330
2310 FIT=546+(TAXINCOME-7600)*.16
2320 GOTO 2580
2330 IF TAXINCOME>16000 THEN 2360
2340 FIT=1234+(TAXINCOME-11900)*.19
2350 GOTO 2580
2360 IF TAXINCOME>20200 THEN 2390
2370 FIT=2013+(TAXINCOME-16000)*.22
2380 GOTO 2580
2390 IF TAXINCOME>24600 THEN 2420
2400 FIT=2937+(TAXINCOME-20200)*.25
2410 GOTO 2580
2420 IF TAXINCOME>29900 THEN 2450
2430 FIT=4037+(TAXINCOME-24600)*.29
2440 GOTO 2580
2450 IF TAXINCOME>35200 THEN 2480
2460 FIT=5574+(TAXINCOME-29900)*.33
2470 GOTO 2580
2480 IF TAXINCOME>45800 THEN 2510
2490 FIT=7323+(TAXINCOME-35200)*.39
2500 GOTO 2580
2510 IF TAXINCOME>60000 THEN 2540
2520 FIT=11457+(TAXINCOME-45800)*.44
2530 GOTO 2580
2540 IF TAXINCOME>85600 THEN 2570
2550 FIT=17705+(TAXINCOME-60000)*.49
2560 GOTO 2580
2570 FIT=30249+(TAXINCOME-85600)*.5
2580 REFUND=TOTALWITH-FIT
2590 CALL CLEAR
2600 PRINT "OUTPUT OPTIONS"
2610 PRINT "--------------": : :
2620 PRINT "PRESS  TO": :
2630 PRINT "  1    DISPLAY SCHEDULE-A": :
2640 PRINT "  2    DISPLAY 1040": :
2650 PRINT "  3    DISPLAY REFUND ONLY": :
2660 PRINT "  4    DISPLAY WITHHOLDINGS": :
2670 PRINT "  5    CHANGE DATA": :
2680 PRINT "  6    SAVE CURRENT DATA": :
2690 PRINT "  7    END THIS SESSION": : :
2700 GOSUB 3830
2710 IF KY<49 THEN 2700
```

The First Complete Programming Guide, *With Programs* for the Popular, Low-Cost TI-99/4A Microcomputer!

Using and Programming the TI-99/4A, including Ready-to-Run Programs
by Frederick Holtz

Over 500,000 TI-99/4A computers were sold last year alone! Now, here's a comprehensive user's and programmer's guide that's an essential sourcebook for anyone who owns or is thinking of purchasing the popular, low-cost TI-99/4A microcomputer! Here's hands-on guidance on every phase of TI-99/4A operaton—*plus* there are plenty of ready-to-run programs! 224 pp., 61 illus.

$16.95 Hard;
$9.95 Paper
Order No. 1620



TAB **TAB BOOKS Inc.**
Blue Ridge Summit, Pa. 17214

To order Call Toll Free: 800-233-1128 (In Pennsylvania, Hawaii, & Alaska Call Direct: 717-794-2191)

ENTH-73

```
2720 IF KY>55 THEN 2700
2730 ON KY-48 GOTO 2740,3320,3540,3580,690,3690,3800
2740 CALL CLEAR
2750 PRINT "       SCHEDULE-A     PAGE 1"
2760 PRINT "       =========="
2770 PRINT "MEDICAL:"
2780 PRINT "-------"
2790 PRINT "  MEDICINE";TAB(14);INT(MEDICINE)
2800 PRINT "  EXCLUSION";TAB(14);INT(MEDICINEXCL)
2810 PRINT "  DEDUCTION";TAB(19);INT(MEDICINEDED)
2820 PRINT "  INSURANCE";TAB(19);INT(MEDINS)
2830 PRINT "  EXPENSES";TAB(19);INT(MEDPAY)
2840 PRINT "  SUBTOTAL";TAB(19);INT(TOTALMEDICAL)
2850 PRINT "  EXCLUSION";TAB(19);INT(MEDEXCL)
2860 PRINT "  BALANCE";TAB(19);INT(TOTALMED)
2870 PRINT "  MINIMUM";TAB(19);INT(MEDINSDED)
2880 PRINT " *MEDICAL DEDUCTION";TAB(23);INT(TOTALMEDDED): :
2890 PRINT "TAXES:"
2900 PRINT "-----"
2910 PRINT "  STATE TAX";TAB(19);INT(SIT)
2920 PRINT "  PROPERTY TAX";TAB(19);INT(PROPTAX)
2930 PRINT "  SALES TAX";TAB(19);INT(SALETAX)
2940 PRINT " *TAX DEDUCTION";TAB(23);INT(TOTALTAXDED): :
2950 GOSUB 3820
2960 CALL CLEAR
2970 PRINT "       SCHEDULE-A     PAGE 2"
2980 PRINT "       ==========": :
2990 PRINT "INTEREST:"
3000 PRINT "--------"
3010 PRINT "  MOTRGAGE";TAB(19);INT(MORTINT)
3020 PRINT "  CREDIT CARD";TAB(19);INT(CCINT)
3030 PRINT "  OTHER INTEREST";TAB(19);INT(OTHERINT)
3040 PRINT " *INTEREST DEDUCTION";TAB(23);INT(TOTALINTDED): :
3050 PRINT "CONTRIBUTIONS:"
3060 PRINT "-------------"
3070 PRINT " *CHURCH OFFERING";TAB(23);INT(TOTALCONTRIB): :
3080 PRINT "LOSS & MISC.:"
3090 PRINT "------------"
3100 PRINT "  THEFT LOSSES";TAB(19);INT(LOSSDED)
3110 PRINT "  OTHER DEDUCTION";TAB(19);INT(OTHERDED)
3120 PRINT " *LOSS & MISC. DEDUC.";TAB(23);INT(TOTALOTHERDED): : : :
3130 GOSUB 3820
3140 CALL CLEAR
3150 PRINT "       SCHEDULE-A     PAGE 3"
3160 PRINT "       ==========": :
3170 PRINT "SUMMARY:"
3180 PRINT "-------": :
3190 PRINT "  MEDICAL DEDUCTION";TAB(23);INT(TOTALMEDDED)
3200 PRINT "  TAX DEDUCTION";TAB(23);INT(TOTALTAXDED)
3210 PRINT "  INTEREST DEDUCTION";TAB(23);INT(TOTALINTDED)
3220 PRINT "  CONTRIBUTIONS";TAB(23);INT(TOTALCONTRIB)
3230 PRINT "  LOSS & MISC. DEDUC.";TAB(23);INT(TOTALOTHERDED)
3240 PRINT TAB(23);"------"
3250 PRINT "  GROSS DEDUCTIONS";TAB(23);INT(SUMMARYDED)
3260 PRINT "  STANDARD DEDUCTION";TAB(23);INT(STANDARDDED)
3270 PRINT TAB(23);"------"
3280 PRINT "  NET DEDUCTIONS";TAB(23);INT(TOTALDED)
3290 PRINT TAB(23);"======": : : : : :
```

LOOK NO FURTHER
WE HAVE IT ALL !!
Hardware
Software
Accessories
FOR YOUR 99/A

From Third Party to the
complete TI line.

AMBULANCE NEW CARTRIDGE
FROM FUNWARE - IN STOCK

JULY SPECIAL

GEMINI 10x PRINTER
$299.95
EXPIRES JULY 31, 1983

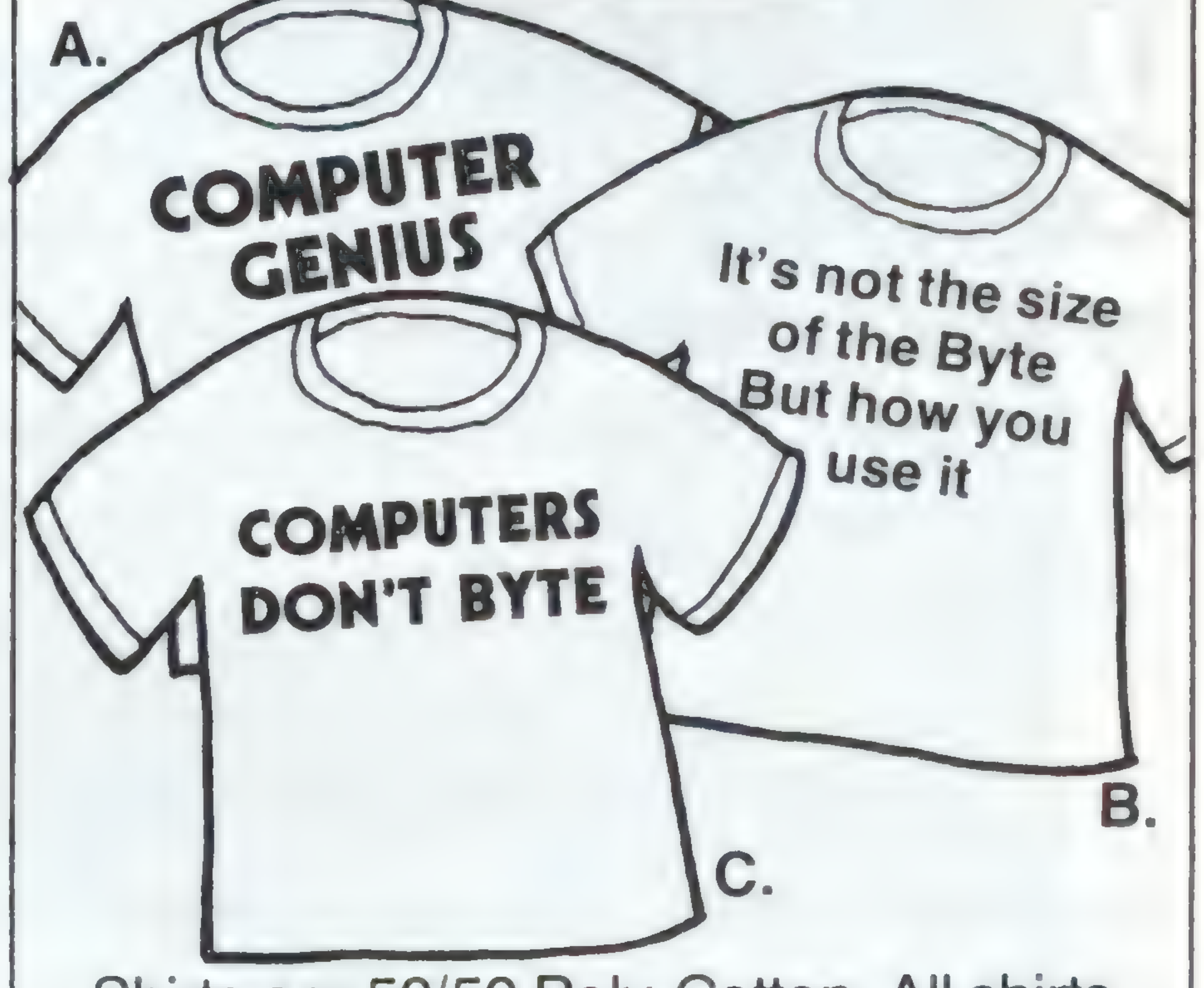
for catalog write:
COMPRO SYSTEMS
P.O. Box 33173
Cleveland, Ohio 44133

(MODEM:con't. from page 25)

the computer itself has become modified for small business and home use, the world of the modem need no longer be unfamiliar territory for the home computer owner. With a little research and homework, the modem could well become a valuable aspect of your business or personal computer systems.

```
3300 GOSUB 3820
3310 GOTO 2590
3320 CALL CLEAR
3330 PRINT "         FORM 1040"
3340 PRINT "         =========": :
3350 PRINT "WAGES,SALERIES ETC.";TAB(23);INT(WAGES+OTHERINC)
3360 PRINT "INTEREST INCOME";TAB(23);INT(INTINCOME)
3370 PRINT "DIVIDENDS";TAB(18);INT(DIVIDEND)
3380 PRINT "EXCLUSION";TAB(18);INT(EXCLUSION)
3390 PRINT "TAXABLE DIVIDEND";TAB(23);INT(TAXABLEDIV)
3400 PRINT "STATE TAX REFUND";TAB(23);SITRETURN
3410 PRINT TAB(23);"------"
3420 PRINT "   GROSS INCOME";TAB(23);INT(GROSSINCOME): :
3430 PRINT "DEDUCTIONS";TAB(23);INT(TOTALDED)
3440 PRINT "EXEMPTIONS(";ACTEXMP;")";TAB(23);INT(EXEMPTIONS)
3450 PRINT TAB(23);"------"
3460 PRINT "   TAXABLE INCOME";TAB(23);INT(TAXINCOME): :
3470 PRINT "TAX";TAB(23);INT(FIT)
3480 PRINT "WITHHELD";TAB(23);INT(TOTALWITH)
3490 PRINT TAB(23);"------"
3500 PRINT "   REFUND";TAB(23);INT(REFUND)
3510 PRINT TAB(23);"======"
3520 GOSUB 3820
3530 GOTO 2590
3540 CALL CLEAR
3550 PRINT TAB(8);"REFUND =";INT(REFUND): : : : : : : : : : :
3560 GOSUB 3820
3570 GOTO 2590
3580 J=1
3590 CALL CLEAR
3600 PRINT "PERIOD INCOME WITHHELD"
3610 PRINT "====== ====== ========": :
3620 FOR I=J TO J+11
3630 PRINT I;TAB(8);INCOME(I);TAB(15);INT(WITH(I))
3640 NEXT I
3650 GOSUB 3820
3660 IF J=13 THEN 2590
3670 J=13
3680 GOTO 3590
3690 CALL CLEAR
3700 OPEN #1:"CS1",INTERNAL,OUTPUT,FIXED 192
3710 FOR J=0 TO 2
3720 FOR I=8*J+1 TO 8*(J+1)
3730 PRINT #1:INCOME(I),ALLOWANCES(I),
3740 NEXT I
3750 PRINT #1:Z
3760 NEXT J
3770 PRINT #1:OTHERINC,OTHERWITH,SIT,SITRETURN,INTINCOME,DIVIDEND,MEDICINE,MEDPA
Y,MEDINS,PROPTAX,SALETAX,MORTINT,CCINT,OTHERINT,CHURCHDED,LOSSDED,OTHERDED,ACTEX
MP
3780 CLOSE #1
3790 GOTO 2590
3800 CALL CLEAR
3810 END
3820 PRINT "PRESS ENTER TO CONTINUE"
3830 CALL KEY(0,KY,S)
3840 IF S=0 THEN 3830
3850 RETURN
```

SILK SCREENED TEE SHIRTS & HATS FOR THAT COMPUTER SOMEONE!


A.
COMPUTER GENIUS
It's not the size of the Byte But how you use it
B.
COMPUTERS DON'T BYTE
C.

Shirts are 50/50 Poly-Cotton. All shirts are light blue & all hats are navy with a white panel.

Mail to: Novelty World, P.O Box 31345
Tucson, Arizona 85751

Qty.	Design	S	M	L	XL	Each	Hdlg	Total
	A					6.95	1.00	
	B					6.95	1.00	
	C					6.95	1.00	
	*Hats Design A only					4.95	1.00	
				Sub Total				
				In Arizona add 5% sales tax				
				Total				

Money back guarantee
Please enclose check or money order
Print name ______
Address ______
City ______
State ______ Zip ______
*Hats one size fits all

Submitting Manuscripts to Enthusiast'99 (Con't. from pg.7)
Articles dealing with specific personal or business use of any computer in the TI family of personal computers, or innovative ideas dealing with programming or hardware are most informative. Articles should appeal to a wide interest group on specific subjects. All manuscripts should be copy edited, error free and ready for typesetting. They should be typed, double spaced with wide margins. Published manuscripts become the property of the International 99/4 Users-Group and our regular rates will be paid upon publication. Unpublished manuscripts will be returned only if a self-addressed envelope with sufficient first class postage attached is enclosed. Why not send your manuscript today!

LIBRARY CORNER

THE DATA GAME

By Guy S. Romano

Senior Staff Editor
116 Carl St.
San Francisco, CA 94117
(415) 753-1194

When browsing through the I.U.G. catalog you will quite often see something like "Using data statements, you can store all the information about your...", First off, it would probably be more significant if the description were to read, "Using DATA STATEMENTS" and ring a BELL.

What exactly a DATA STATEMENT is, what it's used for and how it functions often seems to be a great mystery to many people and thus, we hope here to make it clear and simple to understand for all.

We all know that we can store programs on cassette or on a disk. Many also know that data used in a program may also be stored in a "file" on cassette or disk. But here is perhaps the first roadblock to a clear understanding. Too many writers take it for granted (and too many readers for that matter) that we understand EXACTLY what those words, "data" and "file" stand for in computer jargon because we hear them used outside that field very often and tend to make false associations and linkages with the vocabulary from one field with that of another. But remember that "terminal" means one thing to an airline pilot and quite another to a doctor!

So what is (oops, first error)--what ARE data? Bits of information are data (one bit of information is a datum). By that we generally mean any bits of information. A datum can be one number of one digit like "1" or a cluster of numbers as one meaningful unit "7/4/1983" or a letter or a name.

If we collect some ITEMS (separate units) of data, they form a RECORD. So far we have something like this example made up of FOUR data items:

data item 1

JOHN SMITH

data item 2
123 MAPLE STREET

data item 3
OAKVILLE

data item 4
USA

These four DATA ITEMS form ONE RECORD. If we have a record for Mary Smith and Bill Smith and Helen Smith, then these FOUR RECORDS could make up one FILE.

As you can now readily see (I hope), we are just being very logical in building bigger units out of the smaller ones. Letters make words; words make sentences; sentences make paragraphs; paragraphs make chapters, etc., etc.

When we store data items on cassette or disk we follow this same procedure.

But there is one other way to store your DATA ITEMS with the TI 99/4(A). That is by storing all your DATA ITEMS in DATA STATEMENTS right in the program itself. To tell our computer that this is what we wish to do, all we need is to enter a line in the program that begins with "DATA." Then we put our DATA ITEMS after that word and separate every DATA ITEM with commas. This is so that the computer will know where one DATA ITEM ends and the next one begins. Anything following the BASIC keyword "DATA" is considered to be information we want to store. When a program runs and the computer encounters a line with "DATA" it simply ignores it and goes on to the next line. That is, it ignores it until we tell it to look for what is stored after the word "DATA." This is done by informing the computer to "READ" the information we have stored in the program. Since the computer always ignores a line with "DATA", DATA STATEMENTS can be placed anywhere in a program. When the computer is told to "READ" some DATA, it always starts READing at the first DATA statement found by looking for one starting at the very beginning of the program. It then READs the first DATA ITEM in that "DATA" line. But our computer is smart, that little bugger, because when next we tell it to READ some "DATA", it remembers where it left off and will actually READ the next DATA ITEM in order (up to that comma that lets it know it's at the end of an item) and keeps track of where it leaves off each time.

The computer is smart, to be sure, but Einstein it isn't! When we tell it to READ some "DATA", that's not enough. We must also tell it what KIND of DATA to look for. So here we must be sure we understand two more computer buzzwords; "STRINGS" and "NUMERIC VARIABLES" (to oversimplify a bit). We use variables in our everyday speech, such as, "Well with X dollars you can only buy so much!" The variable here is "X". It is a "variable" because we can replace that "X" with any number we want. Notice I said number. But what if we want the "X" to stand for a word or words as in "If Mrs. X calls..." and in this case Mrs. X stands for Helen Smith. In Computer language we would then call that STRING VARIABLE and change the "X" to "X$ ($ = "string"). So we have NUMERIC VARIABLES (numbers only) or STRING VARIABLES (anything, words and/or numbers). We reflect this then back in our program as the instruction READ X or READ X$. Back there in our sample of DATA ITEMS if we want to READ that data we would instruct the computer to READ A$,B$,C$,D$. The first A$ would be "John Smith; then B$ would be "123 Maple St", C$, "Oakville, and D$, "USA".

If you buy a program which uses DATA STATEMENTS to store data, the first thing to do ALWAYS is to LIST the program on the screen. Find the READ statements and see what kind of data is to be "READ" and in what ORDER. Then look at the first DATA STATEMENT so that you have a sample of how it is laid out. Then you can change those statements to store your own information. Remember too that you can always add as many extra DATA STATEMENTS as your needs dictate.

I hope that this will help in having a better understanding of the material on DATA and READ that is in your User's Reference Guide.

In closing, I offer this "test" for you:

```
100 READ A$,B,C,B$

110 PRINT A$:TAB(12);B;C:B$

120 DATA WHEN YOU HAVE TROUBLE,753,1194,FOR ALL THE HELP YOU NEED.
```

MASTER 99

The International 99/4 Users-Group is pleased to announce the introduction of the first in a series of professional level program sets called the Master 99 Series.

These modules will be sets of programs dedicated to a specific purpose in serious applications of the Texas Instruments 99/4(A) Home Computer in extensive home or small business environments. All have been thoroughly tested and documented for reliability and ease of use in their specific applications.

The Master 99 series will be supplied on disk only, in an unprotected format to enable all users to customize their programs.

Although the needs and hardware requirements for each set vary, one should expect a minimum hardware configuration as follows:

1. TI 99/4(A) console
2. Disk drive w/disk drive controller
3. RS-232 Interface
4. Impact printer
5. Memory Expansion unit
6. Extended BASIC module

The suggested retail price for each set is $14.95.

The first set of programs, now available, is the

#M9-100 Data Base 500

which will also be available as

#M9-101 Data Base 300

for those with single sided disk drives.

Data Base 500 is a very flexible program set which allows the establishment of a data base of 500 records, each of which can hold eight screen lines of data divided into 16 distinct fields. The data base files may be sorted on any of these 16 fields in any number of combinations to create many types of selected subfiles. Printout of the data base is extremely flexible and is limited to the creativity of the user. The main program allows creation of database files, entry, update, display, scan and printout of individual records. The IUG will list each Master 99 Series module as it becomes available.

CATALOG HOUSEKEEPING

12/30/82 — 1200 - Now has more and better graphics. Can be used in BASIC or Ex. BASIC, tape or disk.

12/30/82 — 4376 - Now takes up less memory. Includes choices of types of game one wants to play. Improved graphics.

12/30/82 — 5406 - Now includes capability to sort, delete and alphabetize all data in your files.

12/30/82 — 5423 - Now includes optional use of a printer.

1/1/83 — 5438 - Now has two kinds of sorts in program. More complete with better format. Great improvement.

1/24/83 — 2107 - Now gives options for speed of play and number of plays.

1/24/83 — 4408 - Shortened for more memory space and DISK storage.

1/24/83 — 4409 - Shortened for more memory space and DISK storage.

1/24/83 — 4377 - Cosmetic changes for data for printer output.

2/1/82 — 1069 - Clearer way to play an improved board layout.

2/1/83 — 1093 - Now has better presentation and better sound effects.

2/1/83 — 1132 - Improved sound.

2/1/83 — 1183 - Now usable with Terminal Emulator II.

2/1/83 — 1204 - New options and levels of difficulty hae been added.

2/1/83 — 3231 - Graphics added.

2/1/83 — 4313 - Better error trapping in program.

2/1/83 — 4383 - More data now available in program.

2/1/83 — 5407 - More options now available.

2/1/83 — 5426 - Graphics added with more on-screen helps.

2/1/83 — 5465 - Now can use an optional printer.

2/1/83 — 7020 - Contains the new data for 1982.

2/15/83 — 5437 - New versions for 1983 (1982 tax year) also improved to be available on tape OR disk.

2/25/83 — 1240 - Replaces old 1240 in library.

2/25/83 — 3263 - Replaces old 3263. Now can be used with Ex. BASIC.

2/25/83 — 3272 - Replaces old 3272 and can now be used with Ex. BASIC.

2/25/83 — 3261 - Replaces old 3261 and can now be used with Ex. BASIC.

2/25/83 — 3264 - Replaces old 3264.

2/25/83 — 3258 - Replaces old 3258.

2/25/83 — 7030 - Replaces old 7030 and now can be modified for use with disk.

3/24/83 — 6045 - Algorithms corrected and accuracy improved.

3/24/83 — 1172 - Now has directional firing and auto-drift feature.

3/24/83 — 1236 - Coincidence accuracy improved and levels of difficulty added.

3/24/83 — 1242 - Ships increased to three and crash detection added.

3/24/83 — 1003 - Graphics corrected and music added.

3/24/83 — 1047 - Better layout of program.

3/24/83 — 1057 - Enhanced graphics, sound and a new larger playing board.

3/24/83 — 3275 - Now usable on 99/4A.

(continued on page 56)

SMART PROGRAMMING GUIDE™ FOR SPRITES 5^{95}

This guide will show you some of our professional programming secrets on how to: Use CALL PEEK • Get Sprites to pick up objects, eat dots and lay down a trail. • Shoot sprites without missing a coincidence. • Make one sprite chase another. • Easily convert sprite rows and columns into graphic rows and columns and visa versa. • Generate moving sprite patterns. • Use 3 different CALL KEY or CALL JOYST examples for moving sprites. • Write a GENERAL BAR GRAPHING program (to one pixel accuracy) that shows you sprites aren't just for games.

Full of fast running and Byte saving examples that you can use in your existing programs or combine together to write your own programs. Each example program is fully documented in a step by step method that is easy to understand. A TI 99/4 or 99/4A computer and the extended basic command module are required.

Sorry, no C.O.D.'s or credit card orders. Foreign orders payable in U.S. currency. CA. residents add 6½% sales tax. Shipping and handling U.S., Canada and Mexico 1.50. All other countries 3.50.

15 day money back guarantee.

MG

MILLERS GRAPHICS

1475 W. CYPRESS E-1 • SAN DIMAS, CA 91773

(714) 599-1431

ETCETERA

By Jack Carrel

Staff Technical Writer

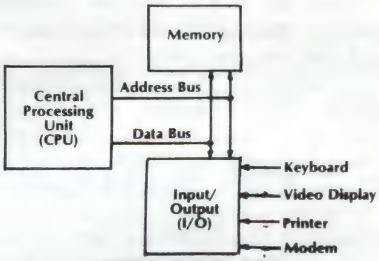
Consistent with an on going policy of the IUG to keep its members informed about their TI products, so that they can utilize them to the maximum extent possible, this article will attempt to give an overall perspective of the operation of the TI-99/4A home computer. The background of the membership of the IUG varies from the computer oriented professional programmer to the new member who has just purchased his or her computer and would like to do more than just play games with the new appliance. As a result of this tremendous cross-section of computer literacy, it is an impossible task to provide a clear and informative explanation of the TI 99/4A computer without either boring the experienced user with already "obvious" facts, or losing the novice with highly technical jargon and explanations. It is the purpose of this article to provide valuable information to both ends of the membership spectrum that will enable the user to increase his or her understanding of the TI 99/4A computer and, thereby, be able to more effectively utilize this potentially powerful home appliance.

Basically, the functional description of all of the popular home computers is about the same. As the explanation of the particular computer becomes more detailed its similarity to other computers becomes less obvious. Therefore, our explanation of the TI 99/4A computer will begin with a discussion of the "generic" computer. Then as the discussion progresses the differences between the generic model and the TI 99/4A will be presented.

The heart of any microcomputer is the central processing unit or CPU. The CPU executes all of the manipulations that are performed by the computer. Normally the CPU can perform operations on only one or two units of data at a time. Therefore, the CPU reads data from and writes data to the next major part of the computer, the memory. In its simplest terms, the operation of a computer can be explained as merely the reading of data from the memory of the computer, performing some sort of operation on that data and then writing the result of the operation back into the memory. The memory is organized into small blocks of data usually eight bits long. It is these very blocks, called bytes, that you will often see and hear used as the measure of the size of a particular computer's memory. The computer memory is organized so that each byte can be separately accessed by the CPU. This can be accomplished because each byte has a unique address, just as your house has a unique mailing address. The memory and the CPU are connected primarily by an address bus and a data bus. Under normal circumstances, the accessing of a byte in memory consists of the CPU placing an address on the address bus and reading the resulting byte from the data bus or placing an address on the address bus and writing a unit of data to that memory location.

A computer with a CPU and a memory can perform many complicated and lengthy operations, but if the results of these operations cannot be relayed to the use in one form or the other, whether it be via the video monitor or the printer, then the work of the CPU is in vane and is utterly useless to anyone. For that matter, if the user cannot communicate to the CPU, then there is no way for him to even relay to the computer what he would like for the computer to do for him. It is this requirement for communications to the world "outside" that leads us to the next major block of our generic computer model, I/O. I/O or input/output is the portion of the computer that communicates to the outside world via the peripheral devices, such as the keyboard, video display, modem, printer or joystick. Usually, I/O is accomplished by assigning one or more memory addresses to each peripheral device. By doing this the CPU can communicate with each peripheral in a manner similar to the way that it communicates with the memory. Each peripheral is then accessed by the CPU when the CPU places the address assigned to that peripheral on the address bus. Then, just as in memory operations, the CPU can read from or write to a particular device. This method of I/O is called memory mapped I/O.

Normally, the video information to be displayed on the screen of the video monitor or television is organized and stored in the CPU memory just as it would be displayed. In other words, each memory location accounts for the information to be displayed in a particular unit area of the video display. For instance, lets say that a particular computer was designed to display a 32x24 character format. Then, if each character location on the display is to be controlled by a particular address in the CPU memory, there would be 768 addresses in the CPU memory that could be used for nothing but displaying video information. If graphics were to be included as a computer function then you begin to see how the amount of memory utilized for this one purpose can begin to grow rather rapidly. This is by far the most popular approach to video information management due to its speed and simplicity. The actual processing, of the memory data into a format that can be displayed, is then performed by some sort of video processor, which continually scans the data in the section of memory dedicated to video I/O and processes this data into true video information that can be displayed on a television or monitor. The video display processor performs its function in such a manner that it appears invisible to the CPU. Other devices that are used for I/O operations such as a printer do not require as much memory for their operations and the memory addresses used by these devices are usually bunched together into one block of memory which is dedicated solely for the purpose of the I/O



GENERIC COMPUTER MODEL

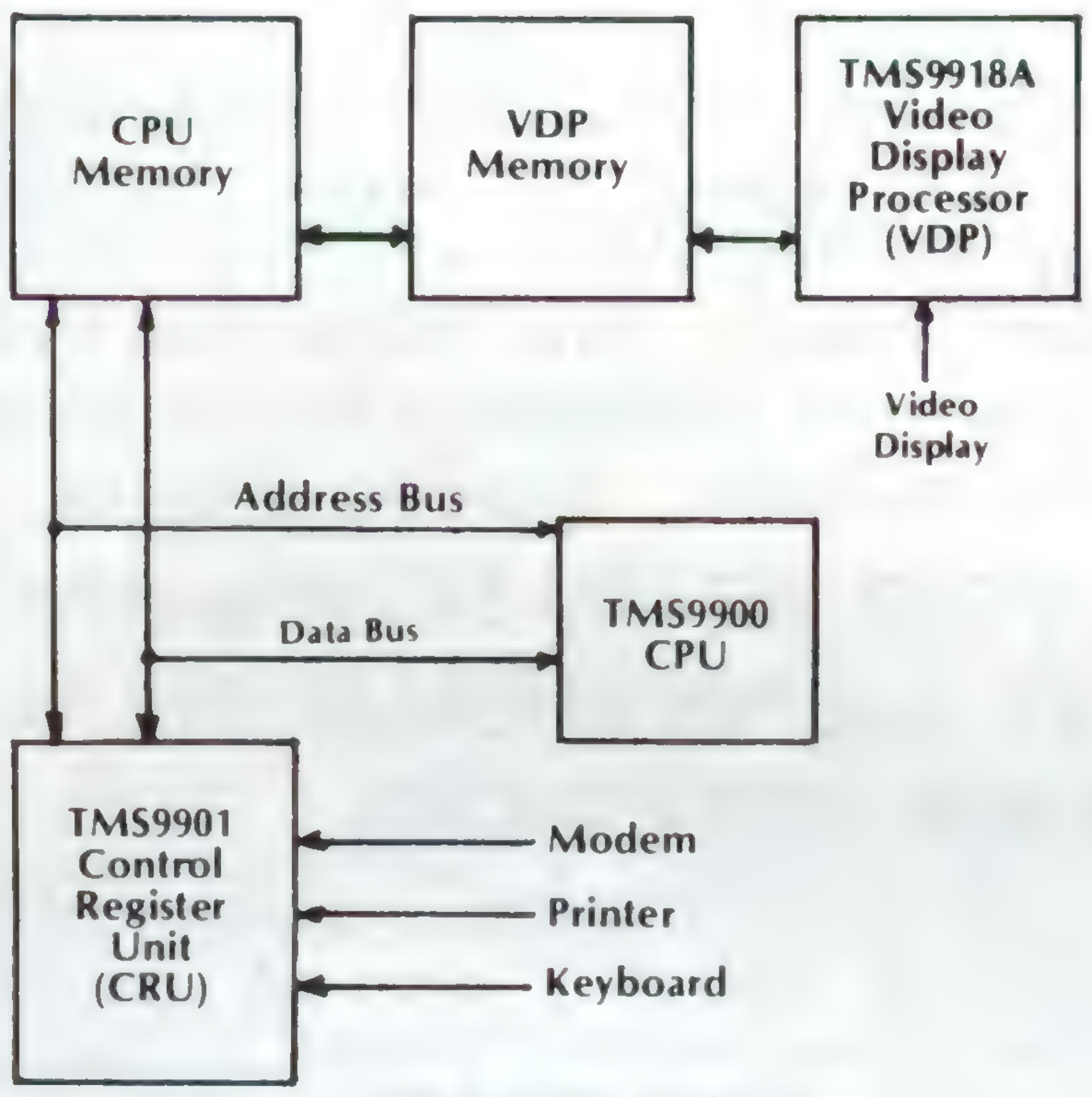
This ends our discussion and development of the generic computer model. It should be understood at this point that this model was developed primarily to discuss the operations of the under $1000 microcomputer. As the price of the computer increases, the demands on performance require the design of the computer to increase in its variation from the model presented above. Just as a high performance race car varies from the standard construction techniques utilized by the consumer automotive industry, the construction of a high performance professional computer varies in its construction from the lower priced consumer oriented product. As we begin to develop the differences in the TI-994A home computer and our generic model, we will begin to see the tremendous bargain that this computer gives the consumer in its emulation of the larger higher priced computer architectures. This computer has its limitations but if compared to the other computers in its price range, there is no reason to obtain any other computer than the 99/4.

The first part of our computer model to be developed was the CPU. Most of the computers in the consumer market have CPUs that perform operations on data in 8 bit or one byte units. In the 99/4, the CPU is a 16 bit processor, the TMS9900. The term 16 bit processor means that the CPU has the capability of performing operations on data in 16 bit or 2 byte units. This increases the speed of the computer and gives the programmer specifically the Assembly language programmer, a much larger arsenal of instructions with which he can develop his programs. Let's face it, even if you are not an Assembly language programmer, you benefit from this because most of the programs you use were probably written in assembly language or a language which was developed and written in assembly language.

The next part of the computer model is the memory. In the 99/4, the memory operations occur similarly to the generic computer operations with the exception that the memory in the 99/4 console is organized in 16 bit units because of the 16 bit attribute of the CPU.

Now we are going to get into a part of the 99/4 that really sets it in a class of its own as a computer in this price range. This is the manner with which the I/O operations are performed. Whereas most computers use memory mapped I/O, the 99/4 does not utilize one bit of memory to access the peripherals. Well, actually it uses only a handful of bytes to perform operations on all of the external devices. First of all, whereas in the generic model the video display processor, VDP, shared its memory with the CPU, in the 99/4 the VDP has its own memory and does not have to tie up a lot of the memory required by the CPU. In this manner the 99/4 can give you high quality graphics without sacrificing the CPU memory which can be utilized for calculations. In fact, it is this very characteristic that causes no small stir in the minds of most sales personnel. Because when an unsuspecting and inquisitive potential buyer asks the sales person for comparisons on the major home computers, this quasi-knowledgeable individual will begin by comparing the sizes of the CPU memory of each of the machines in question. When he gets to the 99/4, if he in fact does mention its existence at all, he will pronounce it as a born loser because although most of the machines in this price range have CPU memories in the range of 5k to 16k bytes, the 99/4 only has 256 bytes of CPU memory. What he fails to inform the unsuspecting customer is that these other machines utilize up to one half of their available CPU memory for the express purpose of video information. Also, most of the computers in the 99/4's price range do not offer the level of graphics that comes with the basic computer.

Meanwhile back to our discussion of the I/O operations of the 99/4, the other peripherals are also controlled in a manner which makes this computer unique. The task of managing peripherals does not utilize the idea of assigning unique addresses in memory for each peripheral to be used. Instead that task is given to the TMS9901, CONTROL REGISTER UNIT or CRU. The CPU communicates directly with the CRU without going through the CPU memory. This saves even more space for the user and also gives the computer the capability of accessing a large number of devices without tying up a large portion of the CPU memory.



TI-99/4A BLOCK DIAGRAM

There you have it. A somewhat quick and not so thorough overview of the architecture of the 99/4 computer. This explanation should leave you with many questions to be answered. Many of these questions cannot be answered at this time due to the limitations of space and time that control this article. But there are a few questions that can be answered at this time simply because of their nature.

First of all, the question should arise in some of your minds, "What happens to those long programs I get from the IUG library if I only have 256 bytes of CPU memory." Even if you are not asking yourself this questions, if you use the 99/4 console in a stand alone configuration, this should be a very important area of concern for you. Primarily, this is because the 256 bytes of CPU memory are not enough memory for most all of the programs in the user's library. This answer can only be reached by going back to our operational model which includes the CPU, CRU, CPU memory, video display processor, and VDP memory. There is 16k of VDP memory supplied with the 99/4 console. This is all of the VDP memory that will ever be required by or made available for the video display processor. Given this large supply of memory, TI developed a basic interpreter that utilizes the VDP memory for program execution. The execution of the computer still depends upon the CPU, but with TI BASIC each instruction that is written in a basic program is read and translated into executable instructions for the CPU by another program called GRAPHICS PROGRAMMING LANGUAGE, or GPL. In other words, this GPL acts as a go-between for the basic program in the VDP memory and the CPU. The CPU memory is simply used as a scratch pad buffer for temporary and intermediate results. This GPL program is the cause of the much touted lack of speed of the TI BASIC interpreter. The slowness of the basic interpreter is just one of many tradeoffs that had to be made in order to make a machine like the 99/4 available in such a low price range. By supplying a computer with such a large VCP memory, TI made available a computer that comes with a complete basic interpreter, and the capability of the best graphics of any computer in the less than $1000 price range. Getting back to the subject at hand, the basic programs you receive from the library are loaded into the VDP memory and are executed by the basic interpreter which is written in GPL.

In closing, I would like to make a few comments on the care and feeding of your computer. This device, like any one of your other appliances around the house, requires a little consideration and maintenance. One of the best things you can do for your computer is to either purchase or make a dust cover for the console. This saves you a lot of trouble down the road as this will keep the keyboard free of any foreign particlels. Even with this precaution, there will be a time when the keyboard will require cleaning. A good sign that your keyboard needs cleaning is an erratic behavior by one or more of the keys. For instance, you try to type an "e" but each time you hit the key several "e"s are printed on the screen. There is no need to rush your computer to the nearest exchange center. You can perform this minor periodic maintenance yourself. Merely purchase a can of contact cleaner from your nearest electronic supply store. This cleaner should be the kind that does not require any form of washing after it is applied. If it is the proper cleaner, it will state on the can that it does not require washing or that it is self-rinsing. When you get the can of contact cleaner, simply spray the cleaner between the keys on the keyboard. You will not need to use the whole can. A 12oz. can should last you several cleanings. The first cleaning of your computer should not occur for quite awhile, depending on whether or not you cover the console when you store it. After several years, it is possible that the required cleaning process will occur on a more frequent basis, but only slightly more frequent.

ASSEMBLY LINE

SIMPLIFY YOUR ASSEMBLY LANGUAGE PROGRAMMING WITH CODING WRITTEN LIKE BASIC

By Bill Gronos
9505½ S.E. 15 #B
Midwest City, OK 73130

Diamond is the hardest substance known to man. Geologists measure mineral hardness with a comparative system called the Mohs' scale. On this scale, the softest substance (talc) rates a "1" and the hardest mineral (diamond) is given a "10". Let's apply this rating system to computer programming languages available for the TI 99/4.

Rated according to increasing difficulty, the programming languages are: Logo, Extended BASIC, BASIC, Pascal and Assembly. If we want to give an indication of the difference in difficulty between languages, we could assign them numerical values: Logo-1, Extended BASIC—2, BASIC 3, Pascal-5, Assembly-10.

While some of these values could be argued, Assembly language is definitely a "10" and is significantly more difficult than the others.

Before one begins learning to program in Assembly, I suggest they consult a mental health doctor; if you are a borderline psychotic, you will likely go over the edge when you encounter the first program bug that fails to be solved in eight hours of super-human effort. There is nothing more depressing than running the Assembly program you designed to draw spectacular screen graphics and instead getting a blank screen and a "locked-up" console. All you can do is rest your head on the keyboard and weep until you regain the stamina to put the program out of its misery with the on-off switch.

This is the point at which many Editor/Assembler owners either: 1, put their heel into the E/A module; 2, use their Editor/Assembler manual as practice material for tearing telephone books in two; 3, decide that the disks that came with the E/A could be better used if they were re-initialized; or 4, all of the above.

If you are of a more placid disposition and you still have your Editor/Assembler laying about unscathed, blow the dust off it and read on; I'm going to make Assembly programming almost as easy as BASIC! "Sure", you say, "And TI just released ten of their new products on time — it's just about as likely!". Read on, skeptics.

AVOID BRAIN-STRAIN AND LET SUBPROGRAMS DO YOUR BUSY WORK

All programming languages are a trade off between ease of use and speed/programming power. In my last article I demonstrated how an Assembly language program can be as much as 1500 times faster than the equivalent BASIC program. Here are two excerpts from letters sent to "Enthusiast 99":

"...What I'm trying to get at in the long, roundabout way is that Mr. Gronos' argument that the relative speed of machines executing Assembly language programs should be the consideration does not appear to be valid when you consider the philosophy that TI spouts about the 99/4. Specifically, that it is a home computer for the 'casual' user. The casual user is going to program in an easy to learn language - usually the one provided with the computer, in this case BASIC. I hope that Mr. Gronos will agree that learning an Assembly language is a tedious and not-too-easy job at best. At least that's been my experience with each of the five Assembly languages that I use on various machines. The average home user is going to program in BASIC, and while the 99/4 excels (SIC) in numeric precision, it definitely falls short in the speed category..."

J. L., Midwest City, OK

(Of course, he means BASIC speed. He knows five Assembly languages and didn't offer any counter programs that could top the .8 second time for the 1 to 10,000 screen counter challenge in the last issue. I can't get any TRS 80 owners to 'fess up and send me the program list and times for an equivalent Assembly language counter program, but one did speculate that it would take at least eighty seconds - 100 TIMES SLOWER THAN ON THE 99/4.)

"...I will be glad to consider your benchmark when you prove to me that you can read the numbers as fast as they are printed on the screen. What is the point?..."

J.D., Mesquite, TX

I was hoping for and expected letters such as these. The point is that speed is what non-99/4 computer owners always bring up when arguing the merits of their computers vs. the 99/4. Until I started using Assembly language, I had no counter-argument but to say that speed wasn't the primary consideration. Now that I can demonstrate that the 99/4 is capable of producing the speed if needed, they now tell me that speed isn't important! I couldn't agree more!

Speed aside, let's compare the VIC-20 to the 99/4. Advantages: it has more keys, e.g. we have to use a shift key to produce a "+", they don't; the disk drive and printer are cheaper; the supplied BASIC is faster.

I must concede all of these points. I'll just briefly touch on a few of the VIC-20's drawbacks: The screen width is a measly 22 characters wide; It has inferior graphics; It comes with about 3 ½K of usable memory; variable names can only be 2 characters long (15 for the 99/4); It has reduced numerical precision and it has no Sprite capability. Forget such BASIC niceties as automatic line numbering and resequencing and a host of others.

You readers will have gathered that I'm a bit of a fanatic about defending my 99/4 against the competition. I just got real tired of having people make statements such as, "Besides my Apple, I've also got a 99/4. I use it to hold the door open". It gives me a sinful pleasure to make people eat those words. Still, in order to take advantage of the high speed 16-bit microprocessor that forms the heart of your 99/4, you have to learn to speak its language, Assembly language. Not an easy task, nor a very pleasant one, but very satisfying and rewarding when you finally get the hang of it.

USING ASSEMBLY TRANSLATED BASIC TO REDUCE YOUR PROGRAMMING HEADACHES

If any of you are content to program in BASIC, read no further. However, if you find that BASIC is a little too slow to give you real arcade action, or you want to do something that simply can't be done in BASIC, then Assembly language is the key. Make no mistake, programming in Assembly language is not an easy task. If we compare writing programs to building models, then BASIC is like building an airplane from a pre-cast, die-cut kit and Assembly language would be making the same model from a solid chunk of balsa wood.

Our model-building burden would be greatly reduced if the pieces were at least rough cut for us. Since many programming tasks are common to a wide range of applications, why can't we rough them out and limit our programming work to sanding them down and fitting them together? Subroutines do save a lot of work, but they often require more time to execute than coding that was custom written for a specific purpose. Luckily, Assembly language has time to kill. Now that we all agree that superfast speed is seldom needed, let's trade off some of that speed and make the programming easier. It seems like a good bargain to cut the Assembly language speed by a factor of twenty if we could make the language 100 times easier to use. We would still be over fifty times faster than BASIC and we wouldn't be as likely to end up on a shrink's sofa. Gronos' Assembly Translated BASIC™ (GATB™ - pronounced GAT bee) may be the answer to your Assembly language programming problems.

I have developed many Assembly subroutines for the myriad of recurring programming tasks. But when it came time to use these I found myself struggling to remember what disk they were on and what registers were needed for which parameters. I finally decided to devise an organized, easily used, comprehensive subroutine system that would form the skeleton of my Assembly language programs, allowing me to concentrate solely on adding the flesh.

What could be simpler or make more sense than to model my subroutine system after a language I was already thoroughly familiar with? In fact, if I were going to spend the time and effort to do a really good job, why not use a format that the majority of other TI users were already familiar with? GATB is modeled after BASIC. Thus, people who are familiar with TI BASIC and Extended BASIC will feel at home. GATB is a set of subroutines that are called by your Assembly program to duplicate BASIC'S functions and subprogram calls. To show you just how similar GATB and BASIC are, let's use the Extended BASIC in-place counter program as an example:

```
100 FOR X=1 TO 10000 STEP 2
110 DISPLAY AT(12,14):X
120 NEXT X
```

In GATB, the same program is:

```
BLWP @FOR
DATA >8000+1,1,10000,2
BLWP @PRINTD
DATA 12,14,>8000+1

BLWP @NEXT
DATA >8000+1

BLWP @END
```

(Note: " 8000" tells GATB routines that this parameter is a variable; in this instance GATB variable #1. That DATA word can be condensed to 8001 and was expanded out for clarity. Since the first parameter in the @FOR routine and the parameter following the @NEXT routine must be variables, the 8000 variable designator can be omitted in these statements with no ill effects. GATB, as presented in this article, allows 256 numeric variables that are numbered 0-255. In GATB programs these variables would be written as 8000- 80FF. Suppose you wanted to use variable #113 in a program. Save yourself the hassle of making the hexidecimal conversion and let your Assembler do it; if you use DATA 8000+113, the Assembler will equate it to 8071.)

In GATB, Branch and Load Workspace Pointer (BLWP) instructions are used to call the BASIC-mimicking subroutines. DATA directives are used to pass the parameters. So, if you are able to write the Extended BASIC version of the program, you can write it in GATB even if you know next to nothing about Assembly programming! Skeptical? Let's try another one.

Can you write a BASIC program that will put the letter "A" in all even screen locations? Your program might look like this:

```
100 FOR ROW=1 TO 24
110 FOR COLUMN=2 TO 32 STEP 2
120 CALL HCHAR(ROW,COLUMN,65)
130 NEXT COLUMN
140 NEXT ROW
150 END
```

Now let's see it in GATB:

```
BLWP @FOR
DATA 0,1,24,1

BLWP @FOR
DATA 1,2,32,2

BLWP @HCHAR
DATA >8000,>8001,65

BLWP @NEXT
DATA 1

BLWP @NEXT
DATA 0

BLWP @END
```

"It looks fairly easy", you say, "But if we are only duplicating BASIC, what is the advantage?" Time and memory space. Not counting the GATB subroutines themselves (just as we don't count the memory used by the BASIC interpreter), the GATB programs require less memory space even though they look more cumbersome. And even though they are shackled with time-wasting subroutines, the GATB programs still execute much faster than BASIC. But best of all, we can easily intermix Assembly language instructions with GATB routines and garner the best of both worlds. And although we have lost the ultra-fast speed of our Assembly code, the GATB counter is still far too fast to read. The Extended BASIC counter takes five minutes to run, but the GATB program only requires six seconds.

I just got real tired of having people make statements such as, "Besides my Apple, I've got a 99/4. I use it to hold the door open.

The GATB language presented in this article is in its infant stage. It grows whenever I need to define a new function. Since I use it mostly to create graphics, I have not yet added any floating point routines. You must either supply your own such routines or be content to work only with integers. Still, it brings Assembly language programming within reach of the average 99/4 user. Think of it as a set of training wheels for learning how to ride a bicycle. Once you get the hang of pure Assembly language programming you can discard the GATB crutch and enjoy the full power of your machine.

However, GATB is no weakling. It mimics so many of the BASIC functions that complex programs can be written entirely in GATB. To prove that claim, I listed out the International User's Group most popular game program, "Cars and Carcases", and set myself the goal that GATB would be capable of translating programs such as these completely, without resorting to any other

Assembly routines except the BASIC-like GATB routines. Of course, it was obvious that I would have to add at least one non-BASIC routine to the GATB language: a DELAY function that lets you specify program pauses in thousandths of a second for up to half a minute. Without the DELAY function, you would have to have "THE FORCE" with you to play the GATB version of C and C.

The GATB language presented in this article is in its infant state ... think of it as a set of training wheels for learning how to ride a bicycle.

This nearly-BASIC language wasn't intended solely for the novice assembly language programmer. GATB is also useful to experienced Assembly programmers as a test bench for their program ideas. Use GATB to experiment with new procedures and, if needed, convert them into more efficient coding. Unlike a compiled BASIC, GATB allows free intermixing of all Assembly instructions. Since GATB runs circles around BASIC, there may not be a need to make conversions into pure Assembly. After all, your TV screen is only rewritten every 1/30 of a second.

Let's compare the graphics improvement of GATB over BASIC with a program to draw character "picture frames" around your screen. The BASIC version is:

```
100 FOR X=65 TO 90
110 CALL HCHAR(1,2,X,30)
120 CALL VCHAR(2,31,X,22)
130 CALL HCHAR(24,2,X,30)
140 CALL VCHAR(2,2,X,22)
150 NEXT X
160 GOTO 100
```

The GATB version would be:

```
L100 BLWP @FOR
DATA 0,65,90,1

BLWP @HCHAR
DATA 1,2,>8000,30

BLWP @VCHAR
DATA 2,31,>8000,22

BLWP @HCHAR
DATA 24,2,>8000,30

BLWP @VCHAR
DATA 2,2,>8000,22

BLWP @NEXT
DATA 0

JMP L100
```

The BASIC version is very ho-hum. The GATB program is dynamic. When it comes to graphics, speed does make a difference, a big difference, and TI BASIC just doesn't have the speed required for truly great graphic effects. However, the 99/4 hardware is capable of providing all the speed needed for super graphics with time to spare. While not nearly as fast as pure Assembly language code, GATB effectively bridges the gap between the slowness of BASIC and the difficulty of writing assembly language code.

And we're not talking about a small increase in speed, such as the maybe seven fold increase you get from Pascal, but a whopping twenty-five to fifty fold improvement! And if any of you have priced out all the gear you must buy if you want to write and run Pascal programs, you'll note an even more important improvement; the bottom line on your bank account.

Have I piqued your interest? Are you chawing at the bit? Perhaps you are still skeptical, sitting back with your arms folded against your chest thinking, "This I got to see!".

Well, there's only room in this article to provide just enough coding and explanation to give you a good tease. I'll give you all the GATB functions you need to write and run the above illustrative programs. The rest will have to be saved for future articles. It will take four or five more articles to give you the rest of it.

I hope to teach you a few tricks along the way. After all, if I'm to present the equivalent of Extended BASIC's "CALL SPRITE" (#sprite-number, character-value, sprite-color, dot-row, dot-column, row-velocity, column-velocity), I might as well include a course in Sprite theory as used in Assembly language along with the coding. First, we'll start with an overview of GATB.

1. GATB functions will duplicate BASIC functions as closely as possible.
2. Function parameters will directly follow the keywords as data strings. Registers will not be used for these values.
3. GATB will start out with a limited arithmetic capability. Only integer values will be allowed. Variables must be in the range of -32768 to 32767. Constants will be limited to the range 0 to 32767. Values such as 23.56 will not be allowed until floating point routines are implemented into GATB.

Program registers are to Assembly language what variables are to BASIC. Since registers are not going to be used in GATB, and with variables being essential to BASIC, a substitute system was necessary. GATB was developed using the KISS system (Keep it Simple, Stupid). If the 15 character variable names allowed in BASIC were used, a complicated storage and look-up system would be required. Allowing alphabetic names for variables adds nothing to the power of a language; they are simply mnemonic devices.

GATB does not use alpha names for its variables. Instead, variables are assigned by number, similar to register designations. However, one set of registers can contain at most 16 values (0-15) - GATB will initially allow 256 variables (0-255) and can easily be expanded to thousands. That's a whole bunch of variables, so Minimem users might want to only allow 128 or less variables, since memory space must be allocated for these variables.

Speaking of Minimem, GATB was written with special consideration given to a memory space (CPU memory) one-eighth the size available to the Editor/Assembler. In fact, GATB will use the 3K of space used by the Line by Line assembler. It should be apparent that having all the subroutines stored in an area of memory that isn't normally available for program coding will enhance the power of the Minimen.

Back to the subject of variables: as mentioned earlier, GATB variables are represented as the variable number (0-255) plus >8000. Can any of you guess why? In signed hexidecimal notation, >8000 is a negative number (the smallest negative number: -32768). When the GATB numeric expression evaluator encounters a number less than zero, it knows immediately that it is not a constant and executes a routine to determine what it is. If the number is between >8000 and >80FF, it realizes you are referring to a numeric variable and it will perform a look-up value function using the allocated memory area. Let me clear this up with an example: The BASIC expression X*8 +2 equates to 8000*8 +2. GATB will substitute the value of variable 0 when this expression is evaluated. If the expression were C8000*8 +2, GATB would "spin" its random number generator and sub that value into the expression, because C000 is the equivalent of "RND" in BASIC.

Though it is not included in this article, I have already developed the coding for resolving the values of numeric expressions used within GATB functions. To show you what I mean, compare these two BASIC statements:

```
100 CALL HCHAR(R,C,136,5)

100 CALL HCHAR(R+5,C*4-1,136,3)
```

In the first statement, simple variables and constants are used as parameters. In the second line, numeric expressions are also used. The second line eliminates the need for other program lines such as "Let R=R+5", etc. TI BASIC allows numeric expressions in the majority of their BASIC functions so if we are to emulate BASIC as closely as possible, GATB must have the ability to do the same. GATB version 1.0 does allow numeric expressions to be used, but the format is cumbersome. The

GATB 1.0 coding of the second BASIC statement looks like this:

```
L100 BLWP @HCHAR
   DATA >8000,'+',5,'.'
   DATA >8001,'*',4,'-',1,'.'
   DATA 136,3
```

EVALUATION OF NUMERIC EXPRESSIONS IS NOT INCLUDED IN THIS ARTICLE'S GATB CODING

While this format isn't difficult to understand, it's not too easy to type. This leads up to the most exciting GATB feature that I am currently writing: a true compiler that will produce object code directly rather than an intermediate source file! Goodbye ungainly BLWP statement GATB, hello true COMPILED BASIC.

I hope this "leg-up" into Assembly language programming will get everyone as excited about it as I am. The 99/4 has surpassed all expectations I first had when I broke the seals on its factory carton many months ago. And just as the ad states: "this is THE home computer".

The remainder of this article will give enough GATB functions to prove my claims and act as an appetizer. Use it to run the sample programs given earlier and then try some of your own. I solicit your feedback. Tell me what you would like to have if you could add any program functions you ever wanted. One I have in mind is a super-scroll command that will let you selectively scroll any screen section up or down. There are many, many possibilities.

GATB functions presented in this article:

HCHAR, VCHAR, CHAR, CHARV, PRINTD, CLEAR, SCROLL, DELAY,KEY, FOR, NEXT, END.

GATB utilities included in coding:

Variable system, random number generator, support routines for GATB functions.

General format of GATB statements:

Line numbers are only needed for program instructions that transfer directly to other program lines. None of the functions in this article use line numbers. FOR/NEXT statements will control program flow just as in BASIC. ON GOTO, ON GOSUB, etc. will be given in future articles. You can easily use Assembly BRANCH and JUMP instructions as GOTOs. Line numbers must be valid Assembly symbols. Using symbols such as "L100, L110" will help you relate GATB to BASIC. Therefore, B L100 is the same as GOTO 100 in BASIC.

Each GATB function is accessed with assembly BRANCH and LOAD WORKSPACE POINTER (BLWP) instructoins. Parameters, if required, are given in DATA directives following the BLWP instructions. No parameters can be ommitted, e.g. STEP must be specified in FOR instructions even if it is 1.

The following symbols are used in the function formats:

V: variable only. Since the function assumes you will use a variable when this symbol is given in a format, you can use either the variable symbol (>8000), or just the variable number (1). E. G.

```
BLWP @NEXT
DATA >8001 or DATA 1
```

N: Numeric value. Either a constant (32 or >20), a variable (>8001) or the random number number symbol (>C000) can be used.

H: Hexidecimal word (>FFFF, >0001), etc.

Character strings are allowed in GATB, but they will be handled in future articles.

FUNCTIONS:

HCHAR: plot horizontal characters.

Format: screen row, screen column, character number, repetitions. (N,N,N,N)

Example:

```
BLWP @HCHAR
DATA 1,1,65,32
```

This will fill the top row of the screen with "A"s.

VCHAR: plot vertical characters.
Format: Same as HCHAR.

CHAR: Define character pattern.
Format: char number (0-254, 255 is reserved for use by SPRITE function), hexidecimal data. (N,H,H,H,H).

```
BLWP @CHAR
DATA >8007,>FFFF,>FFFF,
     >FFFF,>FFFF
```

Will define the char value stored in variable #7 to be the cursor.

CHARV: define char pattern using data in four sequential variables.
Format: char number, variable. (N,V)

```
BLWP @ CHARV
DATA 1,>8002
```

Will define char #1 using the data in variables #2, #3, #4, #5.

(Note: two character definition functions are required because sometimes the data must be patterns that GATB would interpret to be variables.)

PRINTD: Print decimal value starting at a given screen row and column. This is similar to the Ex BASIC "DISPLAY AT" function.
Format: row, column, number. (N,N,N).

Besides PRINTD, GATB will have PRINTH and PRINTB (print hexidecimal and binary values).

CLEAR: Clear screen (no parameters)

```
BLWP @CLEAR
```

SCROLL: Scroll screen one line (no parameters)

DELAY: Pause execution.
Format: milliseconds. (N)

KEY: read keyboard, return key value and status.
Format: mode, key variable, status variable. (N.V,V,). Mode is same as Is in Ex BASIC "CALL KEY". Mod "0" scans entire keyboard.

FOR: begin FOR/NEXT loop.
Format: variable, initial value, ending value, step. (V,N,N,N).

NEXT: increment loop.
Format: variable. (V)

```
BLWP @NEXT
DATA >8005
```

(Note: variable must be 0-31 in FOR and NEXT.)

END: end GATB program, wait for QUIT to be pressed. (no parameters)

All you have to do now is enter the Assembly code at the end of the article very carefully.

LIMITED PERSONAL MAIL REPLIES

I'm sorry to say that I am unable to do a proper job of answering my mail and also produce quality coding for these articles. I wish to thank all of you who have sent me your comments, for they have really helped me write the type of articles that you want to see. I will reply to all who have sent stamped envelopes as I requested, but I will be unable to do so in the future. I will read every letter that you send and give full consideration to your comments. Please continue to make suggestions, ask questions or voice complaints. I will try to answer widely asked questions in these articles.

(Gronos' Assembly Translated BASIC ™ and GATB ™ are registered trademarks of the International 99/4 Users-Group.)

```
************************************
*GRONOS' ASSEMBLY TRANSLATED BASIC*
*            VERSION 1.0          *
************************************

 DEF FOR,NEXT,CHAR,CHARV,PRINTD
 DEF VCHAR,HCHAR,SCROLL,END,DELAY
 DEF KEY,CLEAR
 REF KSCAN

************************************
*SUBROUTINES USED BY GATB FUNCTIONS*
************************************

*GATB USER'S NEED NOT BE CONCERNED
*WITH THESE ROUTINES UNLESS THEY
*WANT TO DEFINE THEIR OWN FUNCTIONS
*

*GET VALUE OF PARAMETERS
*ACCESS WITH BL INSTRUCTION
*LOAD REG 9 WITH TWICE THE NUMBER
*OF PARAMETERS
GVAL CLR 12
GL1 MOV *14+,@P1(12)
 JLT GL3
GL2 INCT 12
 C 12,9 R9=# OF PARAMETERS*2
 JNE GL1
 RT
GL3 MOV @P1(12),10
 SLA 10,1
 JLT GL4
 MOV @VBASE(10),@P1(12)
 JMP GL2
GL4 BLWP @RND
 MOV @>83C0,@P1(12)
 JMP GL2

*VARIABLE MEMORY SPACE
VBASE BSS 256

*PRIMARY SUBROUTINE WORK SPACE
SUBWS1 BSS 32

*PARAMETER MEMORY AREA
P1 DATA 0
P2 DATA 0
P3 DATA 0
P4 DATA 0
P5 DATA 0
P6 DATA 0
P7 DATA 0
P8 DATA 0

*ROUTINE TO GET SINGLE PARAMETER
*VALUE IS RETURNED IN REG 0
*ACCESS WITH BL INSTRUCTION
GVAL1 MOV *14+,0
 JLT GL11
 RT
GL11 MOV 0,10
 SLA 10,1
 MOV @VBASE(10),0
 RT

*DECODE SCREEN ROW AND COLUMN
*INTO VDP LOCATION
RCVDP MOV @P1,10
 SLA 10,5
 A @P2,10
 AI 10,16351
VDP SWPB 10
 MOV 10,@>8C02
 SWPB 10
 MOVB 10,@>8C02
 RT

*RANDOM NUMBER GENERATOR
*USE ">C000" TO REPRESENT THE
*BASIC "RND" FUNCTION
*"RANDOMIZE" ISN'T NEEDED BECAUSE
*THE BUILT-IN CONSOLE ROUTINES
*AUTOMATICALLY CHANGE THE SEED
*VALUE AT ADDRESS >83C0 DURING
*SYSTEM POWER-UP
RND DATA RNDWS
 DATA $+2
 MOV @>83C0,7
 SRC 2,1
 MOV 5,@RND1
 LI 8,8
RND2 MOV 7,0
 ANDI 0,3
RND1 SRC 4,0
 A @RNDWS(8),@>83C0
 SRC 7,2
 DEC @RND1
 DECT 8
 JNE RND2
 RTWP

***************************
*CODING FOR GATB FUNCTIONS*
***************************

*PLOT HORIZONTAL CHARACTERS
*FORMAT: ROW,COL,CHAR #,HOW MANY?
HCHAR DATA SUBWS1
 DATA $+2
 LI 9,8
 BL @GVAL
 BL @RCVDP
 MOV @P4,0
 MOVB @P3+1,1
HR1 MOVB 1,@>8C00
```

```
 DEC 0
 JNE HR1
 RTWP

*PLOT VERTICLE CHARACTERS
*FORMAT: ROW,COL,CHAR #,HOW MANY
VCHAR DATA SUBWS1
 DATA $+2 ROW,COL,CHAR #,HOW MANY
 LI 9,8
 BL @GVAL
 BL @RCVDP
 MOV @P4,0
 MOVB @P3+1,1
VR1 MOVB 1,@>8C00
 AI 10,32
 CI 10,>4000+768
 JL VR2
 AI 10,-767
VR2 SWPB 10
 MOVB 10,@>8C02
 SWPB 10
 MOVB 10,@>8C02
 DEC 0
 JNE VR1
 RTWP

*PRINT DECIMAL VALUE
*FORMAT: ROW,COL,NUMBER
PRINTD DATA SUBWS1
 DATA $+2
 LI 9,6
 BL @GVAL
 BL @RCVDP
 LI 3,4
 MOV @P3,2
 JLT PD3
 LI 0,>2000 INSERT SPACE IF +
PD4 MOVB 0,@>8C00
 LI 4,PD2
PD1 CLR 1
 DIV *4+,1
 AI 1,48
 SWPB 1
 MOVB 1,@>8C00
 DEC 3
 JNE PD1
 AI 2,48
 SWPB 2
 MOVB 2,@>8C00

*CLEAR SCREEN
*FORMAT: NO PARAMETERS
CLEAR DATA SUBWS1
 DATA $+2
 LI 10,>4000
 BL @VDP
 LI 0,767
 LI 1,>2000
CR1 MOVB 1,@>8C00
 DEC 0
 JNE CR1
 RTWP

*DEFINE CHARACTER
*FORMAT: CHARACTER #,HEX DATA
*HEX DATA MUST BE 8 BYTES
*VARIABLES NOT ALLOWED FOR HEX DATA
CHAR DATA SUBWS1
 DATA $+2
 BL @GVAL1
 MOV 14,2
 AI 14,8
CH2 MOV 0,10
 SLA 10,3
 AI 10,>4800
 BL @VDP
 LI 0,8
CH1 MOVB *2+,@>8C00
 DEC 0
 JNE CH1
 RTWP

*DEFINE CHAR WITH VARIABLE DATA
*FORMAT: CHAR #,VARIABLE
*FOUR VARIABLES STARTING WITH
*PARAMETER VARIABLE WILL BE USED
*TO DEFINE CHARACTER
CHARV DATA SUBWS1
 DATA $+2
 BL @GVAL1
 MOV *14+,2
 SLA 2,1
 AI 2,VBASE
 JMP CH2

*START FOR/NEXT LOOP
*FORMAT: VARIABLE,START VALUE,
*STOP VALUE,STEP
*ONLY VARIABLES 0 TO 31 CAN BE
*USED UNLESS MORE MEMORY IS
*ALLOCATED
FOR DATA SUBWS1
 DATA $+2
 LI 9,8
 BL @GVAL
 MOV @P1,1
 SLA 1,1
 MOV @P3,@FORMAX(1)
 MOV @P4,@FRSTEP(1)
 MOV 14,@FORADD(1)
 MOV @P2,@VBASE(1)
 RTWP

*MEMORY AREA FOR FOR/NEXT VALUES
*EACH MUST BE TWICE THE NUMBER
*OF VARIABLES THAT CAN BE USED
*AS FIRST FOR/NEXT VARIABLE
FORMAX BSS 64
```

```
FRSTEP BSS 64
FORADD BSS 64

*INCREMENT FOR/NEXT LOOP
NEXT DATA SUBWS1
 DATA $+2
 MOV *14+,1
 SLA 1,1
 A @FRSTEP(1),@VBASE(1)
 C @VBASE(1),@FORMAX(1)
 JH NEXT1
 MOV @FORADD(1),14
NEXT1 RTWP

*SCROLL SCREEN
SCROLL DATA SUBWS1
 DATA $+2
 LIMI 0
 LI 0,32
 LI 2,23
SL3 LI 1,31
 SWPB 0
 MOVB 0,@>8C02
 SWPB 0
 MOVB 0,@>8C02
 NOP
SL2 MOVB @>8800,@SLBUFF(1)
 DEC 1
 JOC SL2
 AI 0,>4000-32
 LI 1,31
 SWPB 0
 MOVB 0,@>8C02
 SWPB 0
 MOVB 0,@>8C02
 NOP
SL4 MOVB @SLBUFF(1),@>8C00
 DEC 1
 JOC SL4
 AI 0,64->4000
 DEC 2
 JNE SL3
 LI 0,32
 LI 1,>2000
SL1 MOVB 1,@>8C02
 DEC 0
 JNE SL1
 RTWP
SLBUFF BSS 32

RNDWS DATA 0,>C027,>0E48,>EB1F,>9A93
 DATA >0B04,>2332,0,>1119,>1813,0
 DATA >2239,>2229,>2732,>2F2E,>2F23

*SCAN KEYBOARD
*THIS ROUTINE IS DEDICATED TO ALL
*OF YOU WHO WROTE IN ASKING HOW
*TO USE KSCAN
*FORMAT: KYBD #,KEY VARIABLE,
*STATUS VARIABLE
*KYBD NUMBERS ARE SAME AS USED IN
*EX BASIC-"0" SCANS ENTIRE KYBD
KEY DATA SUBWS1
 DATA $+2
 LIMI 0
 BL @GVAL1
 SWPB 0
 MOVB 0,@>8374
 BLWP @KSCAN
 MOV *14+,1
 SLA 1,1
 MOV *14+,2
 SLA 2,1
 CLR @VBASE(2)
 CB @>8375,@KSTAT
 JNE KY1
 SETO @VBASE(1)
 RTWP
KY1 MOVB @>837C,3
 COC @KSTAT+2,3
 JEQ KY2
 DEC @VBASE(2)
 JMP KY3
KY2 INC @VBASE(2)
KY3 CLR @VBASE(1)
 MOVB @>8375,@VBASE+1(1)
 RTWP
KSTAT DATA >FFFF,>2000

*PAUSE PROGRAM EXECUTION
*FORMAT: # OF MILISECONDS PAUSE
DELAY DATA SUBWS1
 DATA $+2
 BL @GVAL1
DY1 LI 1,80
DY2 DEC 1
 JNE DY2
 DEC 0
 JNE DY1
 RTWP

*TERMINATE GATB PROGRAM
END DATA SUBWS1
 DATA $+2
 LIMI 2
 JMP $
 END
```

(CATALOG HOUSEKEEPING: con't. from page 47.)

3/24/83 — 1039 - Translated to use Terminal Emulator II.

3/24/83 — 1020 - Translated to use Terminal Emulator II.

4/9/83 — 1065 - Program has had minor bugs corrected.

4/9/83 — 4336 - Now has adequate memory available to use on 99/4A.

(Continued on page 57)

RETAILERS SHOWCASE

COMPUTERAGE

When Texas Instruments decided to close its retail facility in the Galleria Mall in Houston, the need arose for a facility in Houston to carry the full line of TI 99/4A products and third-party software. As a result, ComputerAge, Inc., was formed.

Located in the Sharpstown Mall, ComputerAge offers a wide variety of software for the 99/4A, wider than any other store in the Houston area.

In addition to the complete TI Computer Line, ComputerAge also features products from Futura Software, Moonbeam Software, Dynamic Data Devices, Romox, and Funware. The store also carries products for the Timex 1000, Commodore 64 and Vic-20.

ComputerAge features a full line of computer-related books and magazines, including Enthusiast '99. Evening classes in Programming TI BASIC and Commodore Basic are offered each week.

John Andrews, store manager and vice president of ComputerAge, heads a staff of well-informed employees. Some are ex-TI retail store employees; others include Jane McAshan, vice-president, Houston Users-Group, and Greg King, formerly from TI's Computer Advantage Club, now teaching classes in BASIC programming at the store. Also working part time at ComputerAge is Bill Delvalle, newsletter editor for HUG.

Around the first part of July, ComputerAge will open a second store in the Prestonwood Mall in Dallas. The store will offer extensive software coverage, characteristic of the ComputerAge in the Sharpstown Mall.

In addition to the wide range of computer hardware and software, both ComputerAge stores carry a full line of Texas Instruments calculators, and accessories such as paper, batteries, and adapters.

The staff at ComputerAge is available not only to aid store customers, but as product support specialists to new home computer owners.

The staff's main objective is to be as helpful and informative as possible, Andrews said, "so that the customer leaves with the products best suited for his needs."

"When customers are having programming problems or questions after the purchase we want to follow through with support by answering their questions and helping them solve their problems, either in the store or over the phone," he said.

ComputerAge is more than just a computer retail facility. In addition to offering the full line of TI products and accessories, ComputerAge has an extensive software department, other lines of computers, and an experienced staff ready at all times to assist the consumer in all phases of the home computer program. ComputerAge, Inc., is Houston's most complete, unique facility for the home computer owner. The store is located at 160 Sharpstown Center, Houston, Texas, 77036, (713) 270-1257.

DENALI DATA

DENALI DATA DESIGN
1413 N. McKinley Ave.
OKLA. CITY, OK 73106
1-405-524-7764

item	description	retail
PARALLEL CABLE (PCAB)	RUGGED ASSEMBLY, FULLY SHIELDED TWISTED PAIRS, WITH QUALITY COMPONENTS. STANDARD 4 FOOT CABLE. (EPSON, GEMINI, PROWRITER, SMITH CORONA & STANDARD CENTRONICS) etc. 16-36 pin	40.00
MONITOR CABLE (MONCB)	3 FOOT CABLE COMPLETE WITH ADAPTOR TO ALLOW USE WITH ALL POPULAR MONITORS & RECEIVER-MONITORS. RCA and MINI JACKS INCLUDED.	18.00
DUAL CASSETT (CASS2)	DUAL CASSETTE CABLE	18.00
"Y" SERIAL (SCABY)	8" "Y" TO CONVERT PERIPHERAL EXPANSION BOX RS232 CARD TO TWO PHYSICAL PORTS (SUCH AS PRINTER AND MODEM).	30.00
SERIAL CABLES		
MODEM (SCABM)	MODEM CABLE	25.00
PRINTER (SCABP)	PRINTER CABLE	25.00
ARTI-STIC (JOYA)	JOYSTICK ADAPTER ALLOWS THE USE OF TWO ATARI OR ATARI COMPATABLE JOYSTICKS.	15.00
MODULATOR EXT. CABLE		15.00
MONITOR EXT. CABLE		15.00

ALL DENALI DATA PRODUCTS CARRY A 100% WARRANTEE — IF FOR ANY REASON YOU ARE NOT SATISFIED WITH A PRODUCT, RETURN IF FOR A FULL REFUND OF THE PURCHASE PRICE WITHIN 30 DAYS. IF A PRODUCT FAILS WITHIN THE FIRST YEAR WE WILL REPAIR OR REPLACE IT AT NO COST TO YOU.

(CATALOG HOUSEKEEPING
con't. from page 56.)

4/9/83 — 7006 - Now has a better format and is much easier to read.

5/2/83 — 1202 - Now can use either keyboard or joysticks.

6/6/83 — 6045 - Program is NOT in Extended BASIC. Correct chart.

6/6/83 — 1003 - No Speech is required for this program.

6/6/83 — 8031 - This program is written in Extended BASIC.

6/6/83 — 5495 - This program is NOT in Extended BASIC.

6/6/83 — 1360 - **Delete this program** from catalog. It is the same as #1194.

Win a Gemini 10X Printer in Tenex's Sweepstakes

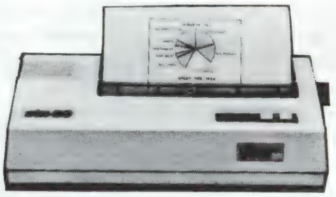
Everyone Wins!

The "Everything Book for the TI Home Computer" is yours just for entering the contest!

A $399 value, the Gemini 10X Printer has a 10″ carriage, friction or tractor feed, 120 CPS and enhanced graphics.

From TENEX . . . the largest selection of software, peripherals and accessories, all compatible with the TI home computer family. Over 600 quality programs for entertainment, education and business. Buy with confidence from TENEX.

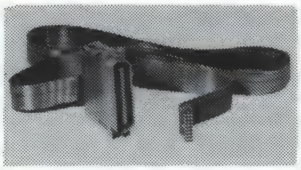
New STX-80 Printer from star micronics·inc



UNDER $200

A full 80-column thermal printer, perfect for the TI 99/4A Home Computer. Don't be fooled by the price; advanced technology has loaded this quality printer with most-wanted features. A nine element print head for superb graphics. All 96 ASCII characters, PLUS 51 European characters, PLUS 64 block graphics. Bidirectional printing at 60 CPS with horizontal tabs and column-scan bit image graphics. The very quiet STX-80 uses standard 8½″ wide thermal printing paper roll.

PRINTER CABLES!!



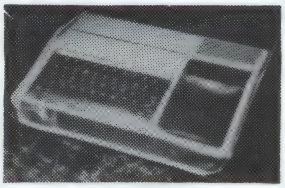
Parallel cable to connect STX-80 other Star Micronics, Epson, or Prowriter to TI's RS-232 Interface Card's parallel port **$24.95**

Okidata or TP-1 Parallel Cable **$37.95**

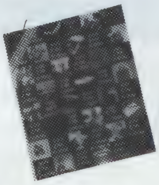
RS-232 Serial Cable **$24.95**

All Tenex Printer Cables are Guaranteed!
Specify printer make and model number when ordering.

CONSOLE COVER SPECIAL



TENEX best quality translucent, antistatic vinyl 99/4A console cover. Exclusive rear corner slit allows for cables and speech synthesizer. . . . . . . **Only $4.95**



TI BOOKS

Kids & the TI 99/4A by Edward H. Carlson. Learning Basic can be great fun — you'll be writing your own programs by lesson five and forever after. Sample programs are easy to understand. Computer graphics and drawings in full color, games and quizzes organize your mind and think creatively. Best of all its FUN! 236 pages, softcover, spiral bound. For 7th grade and up. **Only $19.95**

Programs for the TI Home Computer by Steve Davis. This is the popular book that sold out its first two printings. Dozens of unique programs in TI Basic and TI Extended Basic. Includes ready-to-run programs for games, educational, home and business use. Most highlight features such as color graphics, sound and speech. . . . . **Only $14.95**

Using & Programming the TI 99/4A Including Ready-to-Run Programs by Frederick Holtz. The complete hands-on guide for all phases of TI 99/4A operation. Includes 12 ready-to-run programs plus all you need to start writing your own programs. 216 pages, softcover. **Only $9.95**

TENEX™ Computer Marketing Systems • Box 6578 • South Bend, Indiana 46660
Orders: (800) 348-2778 Questions: (219) 277-7726

ENTRY / ORDER FORM

☐ Please enter my name for the sweepstakes and send me the "Everything Book for the Home Computer"

Name ______________________________

Address ______________________________

City/State/Zip ______________________________

Telephone (   ) ______________________________

MAIL TO: TENEX, Box 6578, South Bend, IN 46660

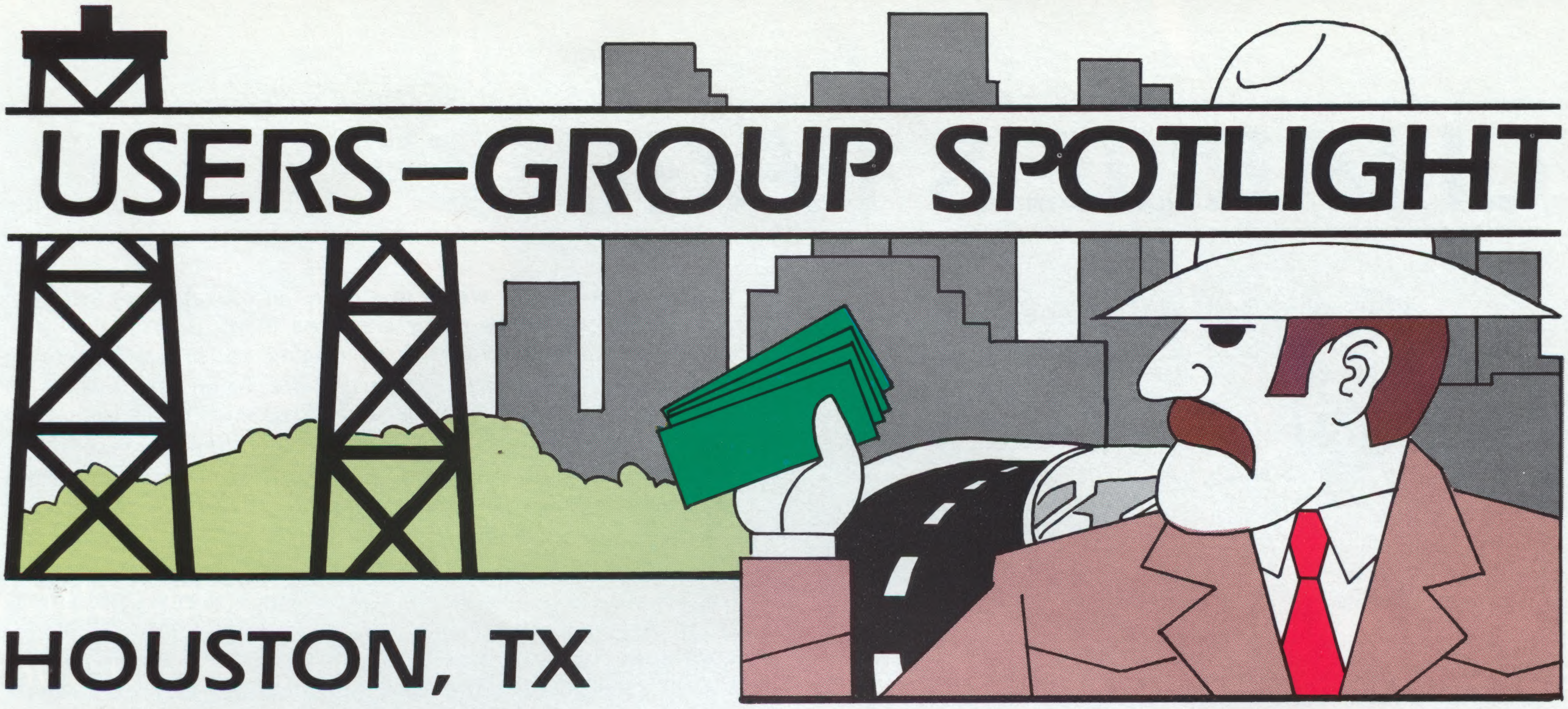
METHOD OF PAYMENT: ☐ Check ☐ Money Order ☐ Visa ☐ MasterCard

Card # ______________________________ Expiration Date ________

	QTY.	AMT.
Star STX-80 Printer @ $199.00		
STX-80, Epson, Star, or Prowriter Interface Cable @ $24.95		
Okidata or TP-1 Parallel Interface Cable @ $37.95		
RS-232 Serial Cable @ $24.95		
Console Cover @ $4.95		
Kids & the TI 99/4A @ $19.95		
Programs for the TI Home Computer @ $14.95		
Using & Programming the TI 99/4A @ $9.95		
Shipping & Handling		1.75
Indiana Residents add 5% tax		
TOTAL		

OFFICIAL RULES

To enter, print your name, address and zip code on the Official Entry/Order Form or on a hand-drawn facsimile. NO PURCHASE NECESSARY. Only one entry per envelope. Mail entries to: TENEX Computer Marketing Systems, Box 6578, South Bend, IN 46660. Entries must be received by August 31, 1983. Gemini 10X Printer will be awarded on or about September 20, 1983, and winner will be notified by mail. One "Everything Book" per household. Winner will be determined by random drawing conducted by an independent judging organization. Chances of winning are determined by the total number of entries received. ALL TAXES on prize, if any, are the responsibility of the individual winner. Void wherever prohibited, taxed or restricted by law. All decisions of the judging organization are final. For the name of the grand prize winner, send a separate, stamped, self-addressed envelope.



USERS–GROUP SPOTLIGHT

HOUSTON, TX

"Joining together for the mutual benefit of all."

It wasn't the slogan for Users-Group members in early 1980; it was an absolute necessity! A Texas Instruments 99/4 owner in 1980 paid $1150 for the console and the 12" Zenith monitor and had two or three Command Modules, at the most, to begin with. When tired of those...

In July 1980, Raymond Wells began the Houston Users-Group (HUG), to "join together for the mutual benefit of all" and prove that "third party software" was not just a term used only by those from another planet.

In October 1980, Bill Hunt, manager of Texas Instruments retail store in the Galleria shopping center, graciously allowed HUG to move their meeting place from Wells' home to TI's retail facility. Twelve people attended the first meeting; not bad for a start, considering there were less than 2000 99/4's in existence at this time.

When TI introduced the August/September 1980, issue of their newsletter, the necessity of Users-Groups became more and more evident as questions and problems concerning the 99/4 were met with little help from Texas Instruments. By March 1981, local Users-Groups had been formed in ten communities around the nation to meet the growing quest for information desired by 99/4 owners.

One of the biggest problems that faced our Users-Group in Houston was organization. Electing officers, establishing a software library, and preparing a newsletter seemed at first to be an easy task. However, it proved otherwise. Raymond Wells, HUG's first president, was beseiged nightly with calls from group members seeking assistance on programming and hardware interfacing. "It was extremely difficult for me to answer many of the new owner's questions, as I had had my 99/4 for only a short time when HUG was formed," Mr. Wells said. "Due to the fact that I had a full time job as a geologist, I was not able to spend as much time as I wanted in learning the true potential of my new computer.

"Many times, I referred our members to the International 99/4 Users-Group in Oklahoma because they were the only resource we had which was available to owners during normal working hours. With the help of Jane McAshan, Don Wells, Wayne Wright, and other members of the group we were able to establish our charter and our meetings began to show some organization," Wells went on to say.

In March of 1981, Charles La Fara, President of the International 99/4 Users-Group, was our first speaker. He demonstrated several newly-released TI products and was able to give us some insight on future plans of both Texas Instruments and third-party suppliers. We have been fortunate to have several guest speakers attend our Users-Group meetings including Gary Kaplan, editor of 99'er magazine, Charles Ehninger, Futura Software, Henry Gorman, Jr., who teaches LOGO language, and Kathy Stutters, who demonstrated the TEXNET information service for us.

In January 1983 Texas Instruments closed its retail store in the Galleria shopping center and we were forced to move our meeting place to the Bechtel Energy Corporation building only a few blocks away from our original meeting site. The new meeting area, secured with the help of Don Thorpe, provided much-needed room for our expanding membership, which by now had grown to over 130 members.

Because Houston is so widely-spread, a decision was made to form a satellite group at NASA's Johnson Space Center. JUG may now currently attract more members than the parent group because of its location.

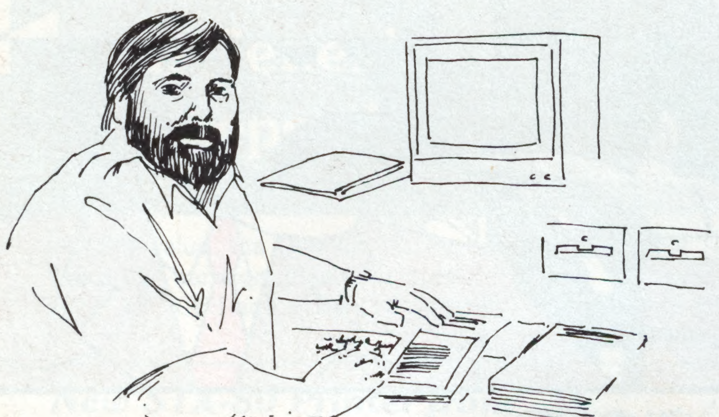
One of our most interesting meetings took place this April with presentations by Charles La Fara and Bill Gronos of the International 99/4 Users-Group. We were treated to advanced showings of several new third-party software products by Mr. La Fara and Mr. Gronos demonstrated several new technical advances, including the use of a light pen and a method of reading source code listings of modules. Also present at the April meeting was John Yantis, Allen Acree, and Edward Wiest, of Texas Instruments, who demonstrated 12-channel quadrophonic sound being produced by the 99/4A while presenting a slide show concerning Texas Instruments products. Additionally, the gentlemen from TI also demonstrated TI FORTH, the 99/2 and the hand-held computer, the CC-40.

This year for the first time we have implemented special interest groups into our meeting programs. After the new and old business portion of our meeting is concluded, we break up into smaller, special interest groups and discuss topics such as Assembly language, telecommunications, BASIC programming, and other specialized fields of interest.

We have just recently acquired, with the help of Mr. Tom Jay, a new meeting site at St. John's school in Houston. This new meeting site will be ideal for our future needs as it is currently equipped with 20 99/4A systems. This offers our members an opportunity to display new techniques to a broader spectrum of our membership.

Anyone interested in joining the Houston Users-Group should contact Mr. Wayne Wright , president, HUG, 18103 Bambridge, Houston, TX 77090, or call (713)440-5119. Anyone planning a visit to the Houston area is cordially invited to attend either the Houston or Johnson Space Center meetings.

CHARLIE'S PAGE



By Charles La Fara

President, International 99/4 Users-Group

GRADE LEVEL: FRESHMAN
SUBJECT: MARKETING 101
CLASS FEE: $145

Although some analysts and reporters have said the no-show of the Armadillo, 99/8, at the June Consumer Electronics Show was the first sign that something was amiss at Texas Instruments, we disagree. The product has been no real secret since TI's Consumer Products President, William Turner, leaked its existence to his favorite publication, Home Furnishings Daily, in early January. It is quite possible that Texas Instruments may have withheld its formal announcement of the Armadillo until they could study competitive products on the showroom floor, and build marketing strategies which would assure the Armadillo's success.

Almost any first-year marketing student can tell you about the razor/blade theory of marketing and how it is supposed to work. After all, it is one of the greatest stories in our free enterprise system. Somewhere along the line, the manufacturers of low-end (under $500) computers adopted the theory of "give away the razor to sell the higher profit blades." After all, if it worked for such giants as Gillette and Schick, why wouldn't it work selling home computers?

For the past two years, the low-end computer manufacturers seem to have been trying to revive the razor/blade marketing approach in an effort to increase the sales of their product lines. A good idea, but it could have its pitfalls. One such pitfall of this type of marketing strategy was felt deeply by Texas Instruments recently when it announced second-period losses for 1983 of $100 million, which it blamed mostly on its home-computer, the 99/4A.

How can a giant computer manufacturer such as Texas Instruments lose $100 million on a product line that represents less than 5% of its total sales?

Easy, poor management!

Although I do not see myself as a marketing genius by any stretch of the imagination, it is fairly clear to see that three near-fatal mistakes were made by TI's Consumer Products Division in the home computer area.

First was the total lack of quality consumer marketing personnel. Rather than going outside Texas Instruments to find key personnel familiar with marketing consumer-type products, Texas Instruments elected to build its home computer marketing strategy using an outsider recruited from another large mainframe computer manufacturer, Digital Equipment Corporation.

The second mistake was three-fold: lack of faith in their own products, conservative advertising, and poor press relations. As the battle shaped up for dominance in the home computer market, three products shared the limelight. The Vic-20, Atari 400, and the 99/4A; three different home computers which could easily have been marketed on merit rather than price.

Enter human nature. Give three similiar products to three individuals to sell and one will eventually take the first step and sell below the price of his competitors. As price-cutting wars began, it was evident that the Atari 400 would be the first home computer to die. After all, Atari is not a manufacturer of semiconductors and could not compete with the rapid decay of profit margins in its machine. What was left were two fierce competitors vying for potential sales of as many as 8 million new units in 1983. It boiled down to Texas Instruments, the industrial giant, and Commodore, the upstart entrepreneur.

What Texas Instruments' marketing strategists failed to realize as the price-cutting wars began was that while they were selling Cadillacs, the competition, Commodore, was selling Chevys for the same price and the consuming public was not told the difference.

One of the first lessons taught to any greenhorn salesman is "SELL BENEFITS, BOY!" It does not take a college education to see that the 16K computer built by Texas Instruments offers many more benefits than the 4K computer built by its competitor. But someone forgot to tell this to John Q. Public.

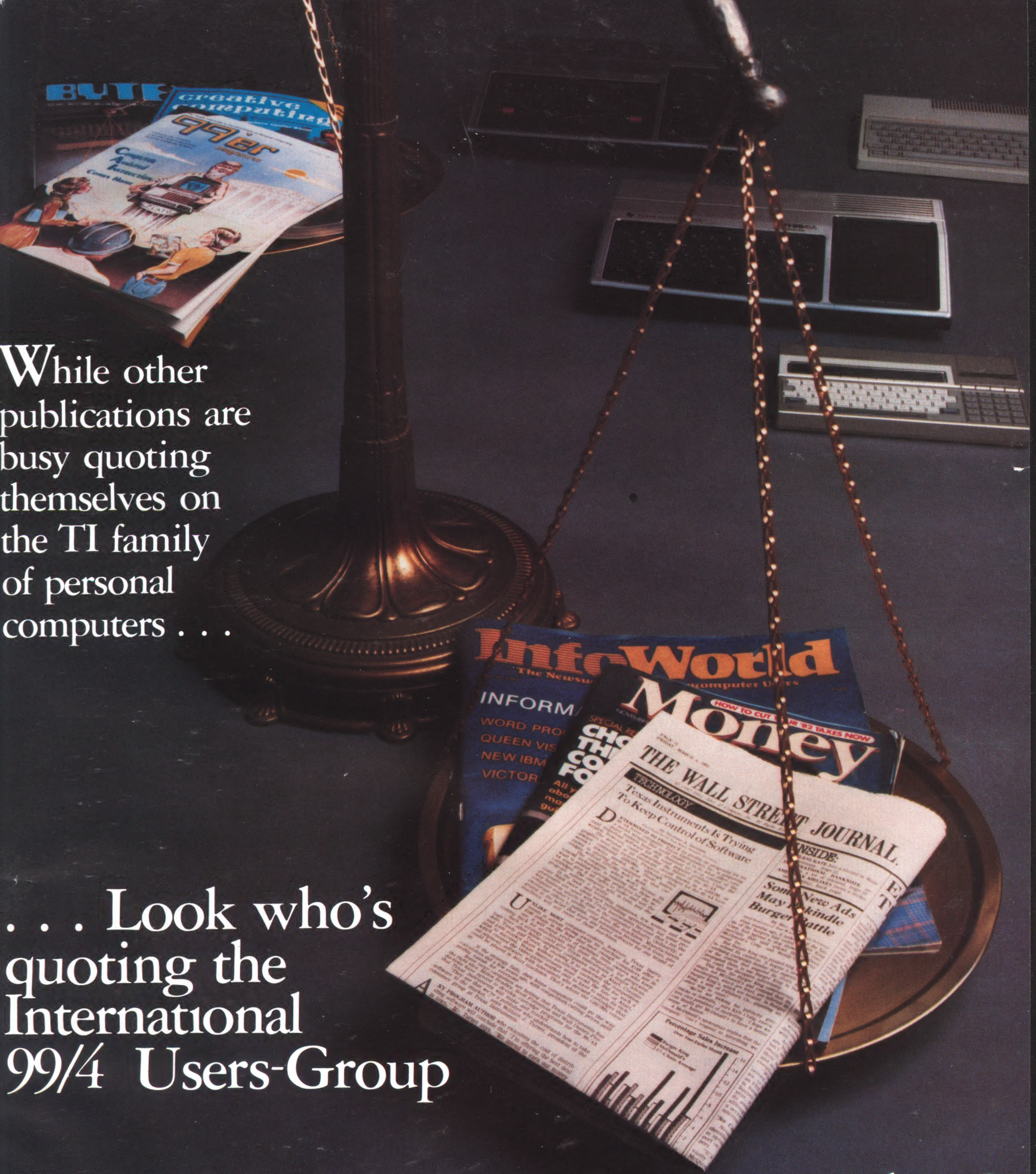
Through proper aggressive advertising and improved press relations, Texas Instruments could have proven that their product was far superior and still have retained high volume sales with more realistic profit margins.

The third mistake was not knowing where they stood at all times. Prior to its latest price reduction ($100 on April 15) TI may have miscalculated existing inventories of 99/4A consoles sitting on retailers' shelves and in distributors' warehouses by as much as 200,000 units. By offering price protection to the distributor and retailers when price cuts went into effect the additional cost to TI could have been as high as $20 million for this single act.

Have any lessons been learned? It may be too early to tell. Certainly advertising and press relations have not improved and in fact, may have deteriorated even further as our press contacts seem to know little about what is happening in the outside world. One thing I think can be safely said at this point is that you will not see another $100 price reduction on the 99/4A console in the near future.

I've heard it said that the opera is never over until the fat lady sings. Texas Instruments will not roll over and play dead in the home computer market. In fact TI's president, Fred Bucy, has vowed "to continue a strong program to develop hardware and to conduct a vigorous software expansion program."

Regardless of what happens, the next year is going to be one of the most interesting time frames in computer history.


BYTE
creative computing
99'er
InfoWorld
Money
HOW TO CUT YOUR '82 TAXES NOW
THE WALL STREET JOURNAL.
TECHNOLOGY
Texas Instruments Is Trying To Keep Control of Software
INSIDE:
Some New Ads May Rekindle Burger Battle

While other publications are busy quoting themselves on the TI family of personal computers . . .

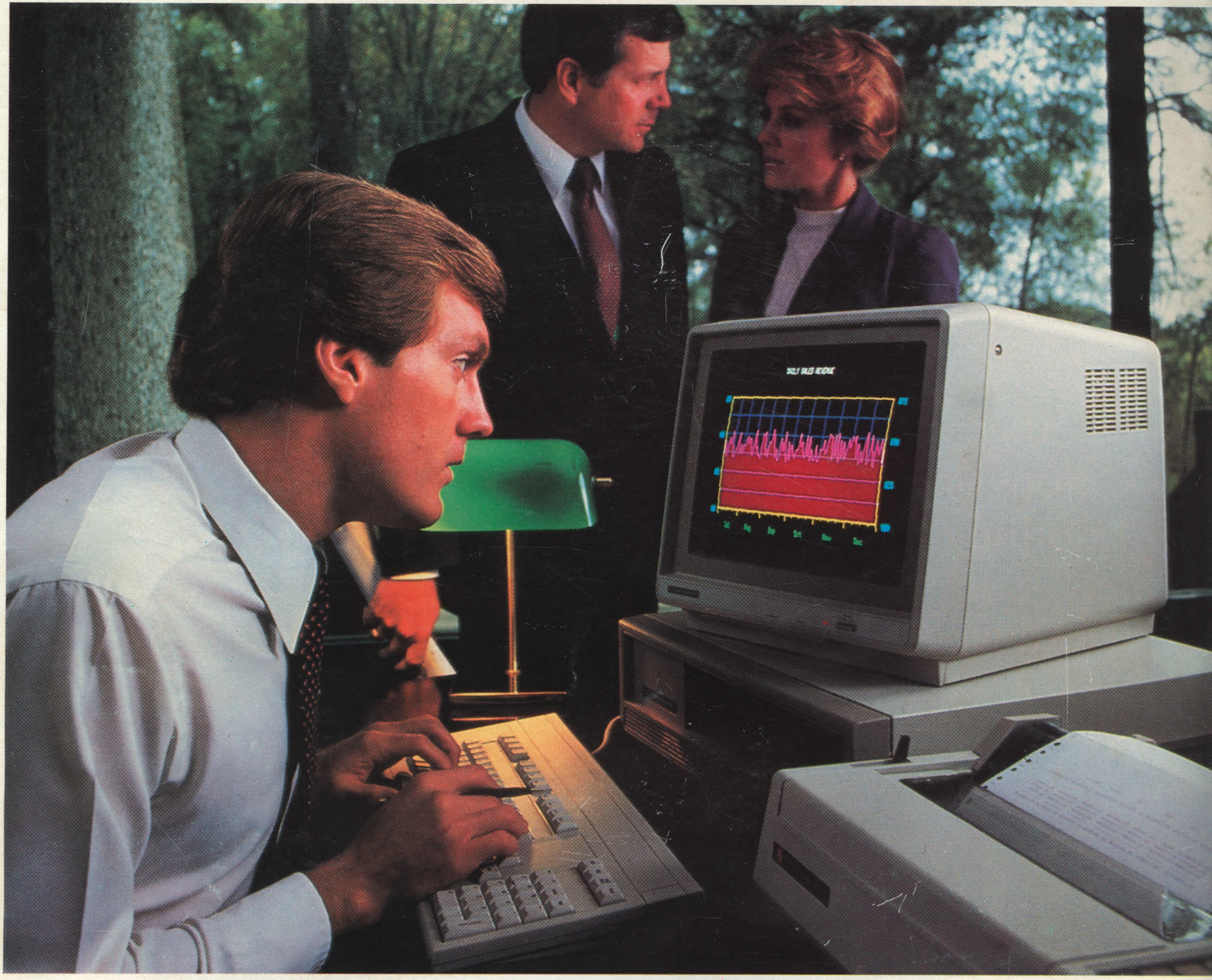
. . . Look who's quoting the International 99/4 Users-Group

Aren't you glad you're a member?

Why not tell someone else about our "quotable" group?

International 99/4 Users-Group

EDUCATION • ENTERTAINMENT • PERSONAL ENRICHMENT



The new TI Professional Computer. It makes you the one with the answers.

To help today's professional and small business executive come up with answers and alternatives, we offer the Texas Instruments Professional Computer. The one with the power, the expandability, the easiest-to-use keyboard, extremely high resolution graphics, and a broad array of software.

All the leading operating systems and programming languages are available. Plus many popular application programs from the best software suppliers to help you create spreadsheets, do word processing, construct graphics, communicate with other data bases or create your own. And for a clear "hard copy" printout of information, you can rely on the new 850 Series printers, made by TI especially for the new TI Professional Computer.

The TI Professional Computer. It helps you make better decisions based on better information. Because it makes you the one with the answers.

For full information and a demonstration, visit your local computer dealer, or write: Texas Instruments Inc., Dept. DCA042ER, P.O. Box 402430, Dallas, Texas 75240. Or call toll-free: **1-800-527-3500** for the location of a dealer near you.

SPECIFICATIONS

System Unit.
16-bit, 8088 microprocessor, 64K byte RAM, expandable to 256K bytes, 4K byte graphics display memory, 5-slot expansion bus.

Keyboard.
Specially designed low profile. Popular typewriter layout. 97 keys, including 12 function keys. Separate numeric keypad and cursor control clusters. Tactile response, for quick positive entry. "Upper- and lowercase" letters.

Display Units.
12-inch monochrome (green phosphor) or 13-inch full-color, 25 lines x 80 columns. High resolution, 720 x 300 pixels.

Mass Storage.
Built-in 320K byte diskette standard. Additional internal storage of 320K byte diskette, or 5 or 10 Mbyte Winchester disks optional.

Communications Options.
300 BPS or 300/1200 BPS internal modem TTY, 3780. 3270 SNA stand-alone (Summer 1983). 3270 BSC and SNA cluster (Fall 1983).

Applications Software.
Over 100 programs available from the most popular software vendors such as Microsoft, Ashton-Tate, "Micro-Pro," IUS, Sorcim, Peachtree, BPI, Lifeboat and others.

Printers.
150-cps TI 850 Series for most applications.

TEXAS
INSTRUMENTS

Creating useful products
and services for you.

Copyright © 1983 Texas Instruments

261488E

021 20 21 23 24 26 33